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PRACTICAL TUBERCULOSIS

PRACTICAL TUBERCULOSIS

A BOOK FOR THE GENERAL
PRACTITIONER AND
THOSE INTERESTED IN TUBERCULOSIS

BY

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PREFACE

It has been impossible for me to give the credit in this small volume, to all my past associates in tuberculosis work for their many suggestions and much good advice, without which suggestions and advice the writing of this small book would have been impossible.

I have received much benefit from the following books, coupled with the advice and suggestions of my teachers and associates, and I wish to pay my respects here to the authors and editors of the following books and journals:

HAWES: Early Pulmonary Tuberculosis.

BROWN: Rules for Recovery from Tuberculosis.

CORBETT: The Causes of Tuberculosis.

POTTENGER: Clinical Tuberculosis.

BONNEY: Pulmonary Tuberculosis and Its Complications.

CLAPP: Auscultation and Percussion.

KNOFF: Tuberculosis as a Disease of the Masses and How to Combat It.

The American Review of Tuberculosis.

The Journal of the Outdoor Life.

My thanks are due R. E. Luhn, Jr., for assisting in preparing the manuscript of this book.

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INTRODUCTION

There are today many books to be had dealing with the subject of tuberculosis. The majority of these books are very lengthy and deal with the many theories of tuberculosis; and while they are indispensable to the specialist and research worker, still they do not appeal to the general practitioner, who is looking for information that will be of practical value in his cases in question, especially from the standpoint of diagnosis and treatment.

The author fully realizes the great part to be played by the general practitioner in the Antituberculosis Campaign, and also realizes that many of these practitioners have not had adequate training in the branches of tuberculosis as understood to-day.

Numerous papers on the different phases of tuberculosis have been published in nearly all the medical journals; however, these articles are widely scattered and very easily mislaid.

There are a few small books on the subject of tuberculosis, which are more practical for the general physician than are the larger works, but there seems to be room for one more such book. It is the hope of the author that the practical considerations in the different chapters of this small book will tend to help the general physician to be more on the lookout for the practical than the theoretical when considering his tuberculosis patients.

J. B. McKNIGHT.

PRACTICAL TUBERCULOSIS

CHAPTER I

HISTORY OF TUBERCULOSIS

In the early medical writings, before the Christian era, there is on record a great deal about the consumptive: the person with the wasted body; the cougher and spitter.

For many years "consumption" was the name given to the conditions where there was a consuming of the body. It was known that consumption was not found in the savage, but in those who lived a community life.

Observers in those times found that those who presented these symptoms of consumption died. The disease was thought to be inherited, since it appeared in generation after generation in the same family. It was also known to be a disease of early adult life.

At this time nothing was known of the cause or effect of the disease in the body; physicians made their diagnosis from the symptoms, which were those of the last stages of the disease. On account of their previous teachings, many physicians of to-day follow the example of earlier observers, with

the result that they do not diagnose their cases until they are advanced and hopeless.

The practice of postmortem examinations came into vogue something over a hundred years ago, and among these cases examined postmortem were many consumptives, with the result that the bodies of these consumptives were found to contain, especially in the lungs, small grayish or yellowish cheesy structures. These small areas were called "tubercles."

It was shown that consumption was caused by the growth and development of these tubercles, though there was no strict definition of the condition known as consumption, nor of the condition wherein a few scattered tubercles were found, which today is known as "incipient tuberculosis." Physicians were only able to diagnose the disease by symptoms which today are recognized as those of advanced tuberculosis or consumption.

Very few physicians listened to the chest. Laënnec, however, developed the arts of auscultation and percussion and compared the findings with pathologic conditions found at autopsy.

By animal experimentation Villemin produced tuberculosis in the animals infected with tubercles from the consumptive's lungs. Others confirmed the results of his experiments.

In 1882, Robert Koch isolated a bacillus which he named the "tubercle bacillus," and proved it to be the cause of tuberculosis.

Since that time many remedies have been given in an effort to cure tuberculosis, without any direct results. Prevention of tuberculosis by education is the object of antituberculosis workers today, as is also early diagnosis, and the institution of treatment at the earliest possible moment. ✓

CHAPTER II

PREDISPOSITIONS TO TUBERCULOSIS

For many years we have been taught that the predisposing causes of tuberculosis such as lack of nourishment, impure air, excesses of all kinds, as well as certain diseases, such as typhoid fever and scarlet fever, made one susceptible to tuberculosis.

In view of recent researches along the lines of immunity, it is evident that some of our ideas regarding the predisposing causes of tuberculosis were, to a great extent, erroneous. The fact that so many people today show that they have had an infection or disease makes one feel that the tubercle bacillus is harbored by the entire human race, and that the predisposing causes do not predispose to infection, but determine to a certain extent the amount and severity of the disease.

We are aware that the tubercle bacilli which are scattered on the virgin soil produce greater destruction than do those which fall where others have fallen. We recall Webb's experiment where he found it possible to inject as many as 150,000 living tubercle bacilli into a guinea-pig at one time, following previous graduated injections, without producing disease, whereas ordinarily so small a number as twenty bacilli would cause disease and death in the guinea-pig.

We can also recall the number of cases of tuberculosis that follow colds of different severity, including genuine influenza. We cannot in a practical way particularize on predisposing causes of tuberculosis, since we do not know at the present time whether these causes work directly or indirectly, whether the predisposition is a result of mechanical changes in cells and tissues or whether it is due to an increased expenditure of energy. It is very probable that any agent or condition which affects the cells of the body individually or collectively interferes with their power of resisting invading microorganisms and their toxins.

Realizing the difference in the reactivity of different individuals, their different habits and inheritances, and also realizing the difference in virulence of different strains of tubercle bacilli, we realize the impossibility of standardizing any predisposition to tuberculosis; and it is evident, furthermore, that what would be predisposing causes for one would not be predisposing causes for another.

A life lived according to the demand of nature, as taught by physiologic laws, would prevent, to a great extent, these predisposing causes, relative as they are, and the opposite would also be true.

For many years the physician and the layman thought one had to be "run down" in order to contract tuberculosis. Without a doubt, this run-down condition is a result of the infection by the tubercle bacilli and not a cause of the infection.

There is no doubt that any person will develop tuberculosis if he will inhale, ingest or pick up in any other way a sufficient number of virulent bacilli at one time.

The evidence of acute infection in persons with lowered resistance, due to fatigue or getting the body chilled unduly, makes one feel that the same condition would predispose to tuberculosis, and that the question of one's resistance may often be answered by a consideration of one's energy.

CHAPTER III

THE CAUSE OF TUBERCULOSIS

In 1882, Robert Koch discovered the tubercle bacillus and proved it to be the cause of tuberculosis. While it is evident that Villemin, Conheim and others were working along the same theoretical lines regarding the cause of tuberculosis, still Koch developed the technic for demonstrating the bacilli.

There are three generally recognized types of tubercle bacilli: human, avian and bovine. The biologic activities of each are slightly different as well as the morphologic appearance. The human and the bovine are more alike than the avian and bovine or the avian and human.

The tubercle bacillus is about one ten-thousandths of an inch in length and one hundred-thousandths of an inch in width. It is rod shaped and multiplies by fission; it is nonmotile and very resistant to the ordinary stains. This power of resistance to stains is claimed to be due to a waxy substance in the bacillus.

At times the tubercle bacillus presents a beaded appearance, and some authors think that this type is found in very sick patients. Often, the bacilli present a branched appearance and are sometimes confused with the streptothrix.

In staining the tubercle bacillus the Ziehl-Neilsen stain is the one most frequently used, although in sputum work, Gabbett's stain has been used to a good advantage. Urine sediments can be examined after being stained and treated with both acid and alcohol in order to rule out the smegma bacillus which resembles the tubercle bacillus.

The virulence or disease-producing properties of one strain of bacilli is different from another, as is also the length of life. Cornet found that tubercle bacilli, found in a room which had been inhabited by a consumptive six years previously, were still virulent. Krause has shown that bacilli live for a long time in caseous lungs which have been buried in the ground. Virulent bacilli have been found in the old calcified lesions of a tuberculous person.

It has been estimated that an advanced consumptive expectorates millions of tubercle bacilli in twenty-four hours. This is ample reason for having the tuberculosis patients cover their mouths when they cough and expectorate into covered sputum cups that are kept away from flies.

It has been estimated that direct sunlight kills tubercle bacilli in from one-half to two hours and that indirect sunlight takes a little longer. The effect of cold is only to retard the growth of the tubercle bacillus and not to kill it. The growth of the tubercle bacillus is naturally slower than that of most germs and requires special media for its growth.

Many general practitioners consider that tubercle bacillus must be present in the sputum before pronouncing a case tuberculous. This idea is a fatal one for many patients of these physicians. When it is possible to demonstrate bacilli in the sputum, the disease is, as a rule, quite far advanced. Many physicians have felt certain from the history of their case that it was tuberculosis, but not finding the tubercle bacillus, have waited until when it was eventually demonstrated the patient was in the advanced stage with little hope for improvement from treatment.

In order for tuberculosis to be transmitted from person to person there must be some continuous cycle of the bacillus transmission from person to person or from animal to animal or from animal to person. The tubercle bacillus can only live in animal tissues. Being nonmotile it requires a carrier. In the case of the young baby, this may be the milk of tuberculous cattle, when it is not pasteurized, or contaminated articles placed into the baby's mouth. In the older person there are many other ways in which the bacillus may be carried from one person to another: by hand-shaking or touching anything that a careless consumptive has touched, or by inhaling the spray from a tuberculosis patient's mouth while coughing. Flies are also great carriers of the disease.

It is not definitely known just how the tubercle bacillus enters the system. It is very probable

that infection results from many different methods of entrance of the bacillus into the body. Many authors assert that the inhalation method is the most frequent, and others, the ingestion method, and still others, that the bacillus first enters into the lymphatic structures of the upper respiratory tract.

We should, by every possible means, overcome all chances of occurrence of infection by isolation of the careless and incorrigible consumptive, and by sterilization of all foods which come from questionable sources.

Tubercle bacilli have been found in practically every place where a careless tuberculosis patient has stayed and also in eating utensils, towels, bed clothing and articles contaminated by such a patient.

Feces of tuberculosis patients contain many bacilli which have not lost their virulence during their passage through the acid of the stomach and the rest of the alimentary tract.

Tubercle bacilli are killed by boiling, by different germicidal agents and by sunlight. They thrive in dark, dirty corners. It is the custom of people to expectorate in dark, dirty corners, thereby facilitating the growth of the bacilli. Hogs frequently contract tuberculosis from cattle by being fed on the milk of tuberculous cattle and also from eating substances contaminated by the feces of the tuberculous cattle.

CHAPTER IV

DIAGNOSIS OF TUBERCULOSIS

Most of the literature of today dealing with tuberculosis emphasizes the importance of early diagnosis. We should not necessarily try to diagnose early tuberculosis but we should try to find active tuberculosis.

Physicians, who have examined many patients, remark that it is impossible to find the adult person with absolutely normal sounding lungs. There are adventitious sounds, or abnormal breath, or voice sounds in every case that a physician examines if he will but put the necessary time into the examination. That many of these signs are due to the activities of the tubercle bacillus is very probable; hence, if one is to treat all cases with abnormal chest signs, one will be treating the entire adult population.

It is impossible to standardize things tuberculous so that one can hit every case, but for all practical purposes one can make a diagnosis of activity if provided with a summary of the case, and if common sense is exercised. Too often the physician depends on the chest signs alone in diagnosing activity when he should have had the temperature, pulse and weight charts, as well as the history and

laboratory findings, to help to decide the stage of the disease.

In diagnosing activity, the toxic symptoms are the most important from a practical standpoint. The tired feeling is the first symptom complained of, as a rule; then nervousness, lack of endurance, loss of appetite, loss of weight and strength, and night sweats. Fever and anemia are also frequently noted. The rapid pulse and the elevated temperature are very frequent symptoms of activity, and it is necessary for the temperature and pulse to be taken, especially during the afternoon, because the patient often exhibits fever at certain times of the day and during the remainder of the day the temperature is normal.

Cough, hoarseness, pain in the chest and circulatory disturbances are further symptoms; but it must be remembered that it is possible to have tuberculosis and never cough; in fact it must be remembered that very few tuberculosis patients exhibit all the signs of tuberculosis even during their entire illness.

Expectoration of blood and sputum are further symptoms of tuberculosis, and often the spitting of blood is the symptom that brings the patient to see the physician. Too often, in the past, the physician has told the patient that the blood was from the throat or bronchial tubes, and the patient has been only too glad to believe this statement, with the result that when he learns the truth about his con-

dition he loses all regard for the physician's ability. Many tuberculosis patients give expectoration of sputum as the first symptom noticed, and this symptom has all too often been blamed on bronchitis or asthma or some other respiratory affection.

Cessation of menstruation is often a result of tuberculosis, as are also irregularities in menstruation, anemia and chlorosis.

Pain in the chest, or in fact any abnormal sensation in the chest, should be considered possibly due to tuberculosis. Physicians seem to have the idea that sharp knife pains must be present before they can say a patient has pleurisy. Patients, when asked if they have pleurisy, will a great many times say no. Further questioning regarding pain brings the answer that they have had pain in the chest for a long time. When the physician questions a patient about pleurisy, he must explain that any abnormal pain or burning feeling in the chest may be due to pleurisy.

Abnormalities in the appearance of the chest, hectic flushing of the cheeks, and clubbed fingers are often found, but more often in the advanced cases; hence, the physician should not rely on these symptoms in determining the presence of early disease.

In considering observation we can often get information as to the presence of complications. The barrel-shaped chest is found in emphysema; asthmatics present the stooped attitude; pleural effusions cause distention and immobilization to a cer-

tain extent; as does also a spontaneous pneumothorax, the differentiating point being that in spontaneous pneumothorax there is a tympanitic note on percussion whereas in pleural effusion the note is flat; also in spontaneous pneumothorax there is a distention of all intercostal spaces if the rupture is complete.

Palpation and percussion are both of practical value in making a diagnosis, since the physician's sense of touch is often better trained than his sense of hearing. It is best to percuss the patient's chest while in different positions, because one can often differentiate between a movable effusion and a consolidation by this method and in no other way, except by the x-ray.

The examiner must be comfortable and relaxed and have the patient in the right frame of mind. Furthermore, he must not be in a hurry when he is attempting to make a diagnosis on a suspected tuberculosis patient, and his mind must be free and concentrated on the case. Having the patient stripped to the waist is very necessary. It is best for the physician to develop a certain routine of examination and to follow this without omissions.

Some physicians take the history first, but I prefer to examine first and then take the history, since one is apt to be biased by what the patient says, and furthermore, it stimulates a physician to find what there is in the chest, thus having his own mental picture of the diseased process. This is especially

true if he has to compare his findings with those of another expert.

My method of procedure is first, while the patient is standing up with chest bared, to observe the chest while at rest and also during expiration and inspiration. I compare the two sides and make notes of any differences in the anatomy or physiology as well as in the general tone, and in the condition of the skin.

Following the observation, the chest is palpated, taking notice of the resistance of the tissues, and also the sound-conducting properties. Next the chest is percussed with both hard and soft strokes and notice is taken of any disparity in the two sides or in the different areas in the same side. Auscultation comes next, first during normal breathing to observe any modified breath sounds and to time the appearance of the adventitious sounds, then with deeper breathing to bring out the sounds missed before. Following the deeper breathing the patient is made to expel the air from the lungs and then cough twice gently while the lungs are empty, with the mouth covered with a tissue to prevent spraying the room with bacilli. It is remarkable how this cough following expiration brings out the latent râles. If physicians would only use this method they would often find more involvement than is found with ordinary breathing. During auscultation the chest is gone over systematically, starting at the right apex covering the

front of the right lung, then the front of the left from apex to base, and then the back in the same way, comparing if necessary different locations. A hairy chest is a great obstacle in examination, and this should be shaved or the hairs should be moistened with soap and water.

After completing the chest examination the ears, nose, throat and glands of the neck are examined. Finally, the history is taken, after having charted down the physical findings. Students of tuberculosis should make their own examinations, chart them, and then compare them with those of their instructor. A study of the normal chest is, of course, necessary before a study of the abnormal is made; the student will find that all vesicular breathing is not the same in force, but may be similar in character.

It is often necessary to observe a case of some length of time before a correct diagnosis can be made, especially in cases with complications which would cause adventitious sounds of their own accord, and also in cases in which one knows that there are abnormal signs in the chest, but is not positive that these signs are due to active tuberculosis. In these doubtful cases the patient should be given the benefit of the doubt; the physician should try to prove that the condition is not tuberculous, instead of trying to prove that it is tuberculous and instituting treatment while making proof.

The physician in the future must rely on the sub-

jective symptoms in the diagnosis of active tuberculosis; by this the author does not mean only the general practitioner, but also the specialist. The teachers of tuberculosis in the past have been, to a certain extent, the cause of the delay in diagnosis in tuberculosis, for the reason that they have had their students listening for crepitant râles and paying too much attention to the chest without enough attention to the toxic symptoms. Tuberculosis specialists today can tell much more about the activity of a case by considering these symptoms than by prolonged examinations with the stethoscope.

X It must be remembered that the case that has the least amount of trouble in the chest may be in a worse condition than the one with advanced lung signs. This, of course, is because the advanced case has, during his long time of disease, walled off his foci and also developed his antitoxin. Dr. Allen K. Krause has told us that a tuberculosis patient's death is due to an accident, hence, there are good reasons for considering the advanced case more optimistically than has been our custom heretofore. A little exercise in the incipient case has innumerable times been the cause of the accident resulting in death. The wall of defense around the focus of infection has not been strong enough, and, as a result of exercise, this wall had broken down, allowing the bacilli to escape, with the eventual production of a caseous pneumonia, miliary tu-

berculosis, or some other acute tuberculous infection, and death.

Persistence is the keynote of the subjective symptoms. The physician must be suspicious of tuberculosis in all his cases and look for the tired feeling, pain in the chest, cough or weak voice, spitting of blood, slight loss of appetite, weight and strength, nervous instability, lack of muscle tone, indigestion, elevated temperature and pulse at some time during the day, especially in the afternoon.

The x-ray is a valuable help in diagnosis, but must be used by one who is trained in lung examinations and plate reading. Very few men can read an x-ray plate properly. Tuberculin is an agent that has been used for diagnosis too often, if anything, as it probably has activated many inactive foci, with consequent death in a number of instances. Regarding tuberculin, Dr. Knopf says: "No tuberculin test should be resorted to if subjective and objective signs and symptoms or sputum examinations have been sufficient to demonstrate an active tuberculosis; and the one who wishes to resort to the tuberculin test should first familiarize himself with the relative value of the tests now used and the precautions which should be exercised to avoid the errors or complications which might arise through injudicious use."

The practical value of the skin test is questionable in adults. This test being a test for anti-

bodies naturally would not prove when the infection causing the antibodies took place, and our present knowledge of tuberculosis shows that in some cases 50 per cent of the children at the age of six years react to the skin test. Dr. Bartlett found this to be the case in the von Pirquet Survey in Framingham, Mass.

I have frequently found that patients with sputum bacteriologically positive for tubercle bacilli, with apparently good resistance and with signs of far advanced disease although not apparently active, would not give a positive skin test.

The complement-fixation test is of some value, but only in conjunction with other signs and symptoms. Dr. Lawrason Brown and Mr. Petroff have shown that guinea-pigs give a positive complement fixation three days after infection experimentally, but it is not known what length of time must elapse in order to obtain a positive complement fixation in the human body, after infection. It is to be hoped that future experimentation by these men and others will remove the present difficulties from this standpoint.

The diagnosis of tuberculosis in very young children is very difficult so far as stethoscopy is concerned and so far as the toxic symptoms are concerned. A history of contact is a great help. Skin tests and x-ray examinations are valuable. Presence of enlarged glands, which cannot be attributed to other conditions and which persist, are

valuable aids in the diagnosis. Sweating of the head, continual bad disposition, fever, rapid pulse, deranged stomach, and poor general appearance are frequent symptoms of tuberculosis in the very young.

It is very difficult to get sputum for examination from the very young; but my experience with my own baby who died at the age of ten months with tuberculosis after a three months' sickness, proves that one should examine the stools of these very small children for the bacilli of tuberculosis, being careful to differentiate, of course, from other acid-fast bacilli.

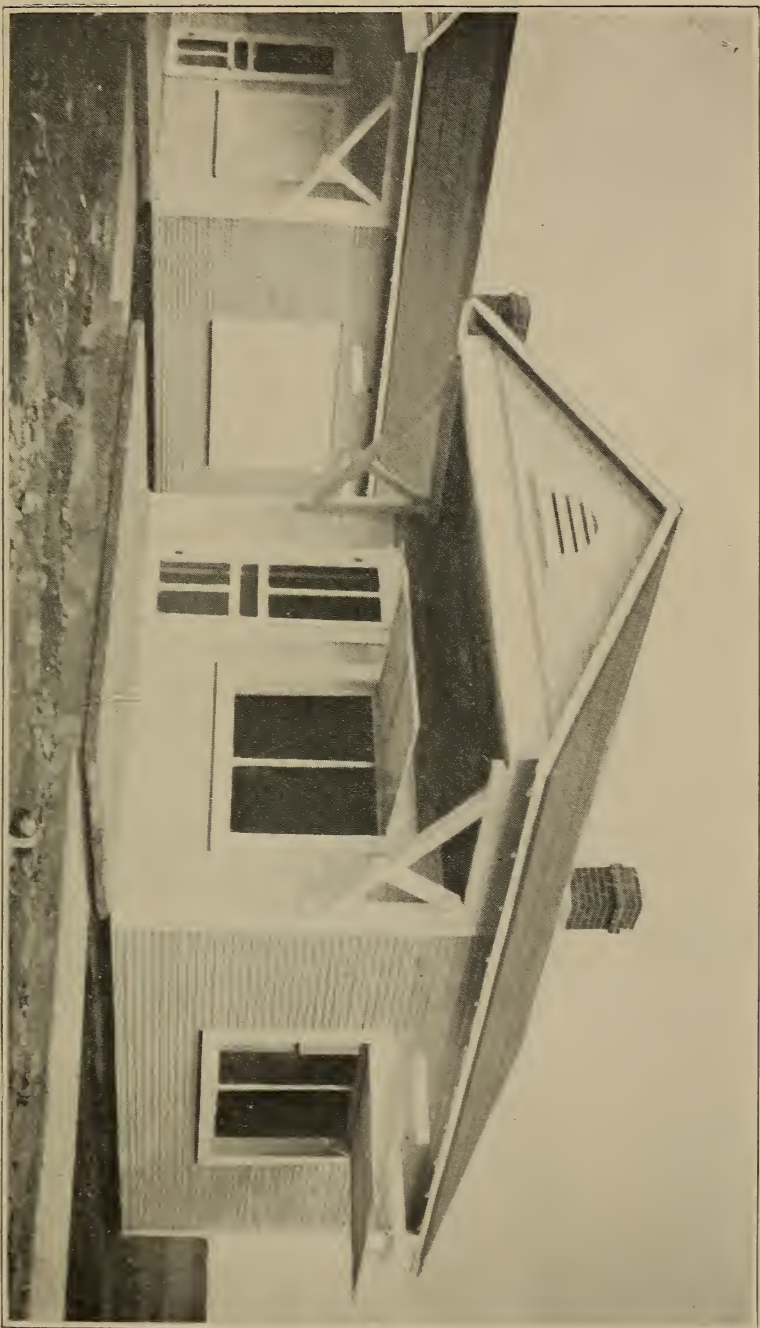


Fig. 1.—Bungalow for tuberculosis patients. Especially adapted for patients in warm climates. This is one of the Texas State Tuberculosis Sanatorium bungalows for tuberculosis employes. Windows on both sides.

CHAPTER V

PHYSICAL SIGNS

It is impossible to tell by the physical signs alone how recent an abnormal condition in the lungs may be or how long such a condition has existed. If it were possible to examine every person at stated intervals, physicians, no doubt, would be able to compare physical signs from time to time and add to the present knowledge of these signs.

One can, however, tell by physical signs the extent of involvement, and this, coupled with a study of the other symptoms: history, x-ray examinations and laboratory reports, is a great help in the summary of the case.

Often the case with the largest amount of involvement and, from a standpoint of physical signs the one with apparently the most activity, is the one that offers the best prospects of recovery, when all other factors in the case are considered.

In order for the general practitioner or the student of tuberculosis to appreciate intelligently the physical signs in tuberculosis, it is necessary for him to understand the anatomy and physiology of the lungs. It is not necessary thoroughly to understand the minute anatomy in anything except the structural unit of the lungs, but the knowledge

of the general makeup of the lungs is essential in order to understand the production of abnormalities in breathing and adventitious sounds.

It is necessary for the physician to have a clear mental picture of the extent of the lungs in the chest, their general shape and appearance, as well as their relation with other structures nearby.

In order to understand the abnormal physical signs, it is necessary first to study the normal chest. When we stop to consider the different breath sounds in the normal lungs, we are impressed with the difference in character of these sounds. This is probably one reason why it is so difficult for the beginner to learn the normal; that is, there is no absolute normal and the line of demarcation between the normal and abnormal is often very much blurred. Age, occupation and the place of residence, as well as habits and inheritances, all enter into the anatomic shaping of the respiratory tract; consequently we have a difference even in the normal physical signs which the specialist often finds difficult of classification.

Concentration of the attention of the examiner on what he is doing is one of the necessary helps in eliciting the chest sounds, and he must be able to hear and have a stethoscope that is comfortable to the ears and auditory canal. Many general practitioners are experts on chest examinations, although they cannot explain always the pathologic conditions producing these abnormal signs.

Physicians have often told me that it was impossible for them to study tuberculosis on account of lack of material. It is not the number of cases examined and treated that makes the tuberculosis specialist; but it is the amount of time spent on a few cases, and the amount of study and interest in each case, that qualify the examiner eventually to be a specialist. So far as lack of material is concerned, it is very evident that a physician would have a very poor practice, who did not have at least twenty tuberculosis patients under his supervision each year, although in most cases these patients are treated for other diseases.

The physician, undertaking a study for the practical signs, must acquaint himself with some of the physical qualities of sound. It is necessary to ascertain the pitch, quality, rhythm, intensity and duration of the inspiratory and expiratory sounds in the normal in order best to compare them with the abnormal. In some cases with slight involvement, it is most difficult to differentiate the normal from the abnormal on account of mechanical or other conditions which change the anatomic make-up of the lungs. The intensity of all sounds is increased or diminished according to the rapidity and force of the respiratory acts. The normal vesicular respiration is on inspiration a soft diffused sound of a breezy character, gradually developed and continuous, and of low pitch. The expiratory sound in vesicular breathing is not vesicular but

feebly blowing in quality, with lower pitch and less intensity than that in inspiration. The expiration is usually not more than one-fourth the length of inspiration, being absent in many cases.

Puerile and senile respirations have the same physical qualities as vesicular respiration, except that in the puerile type the intensity is increased and in the senile, diminished. These respirations are found in all parts of the chest, but may vary in intensity even in the same lung, due to increased activity of certain vesicles.

In tracheal and laryngeal respiration, the inspiration is tubular, loud, dry and hollow. The expiration is tubular, more intense than inspiration, and of little longer duration.

In diseased conditions there are the respirations of abnormal intensity: exaggerated respiration when there is an increased intensity, feeble respiration with diminished intensity, and suppressed respiration when there is no sound heard.

Further, there are those respirations of abnormal rhythm, such as jerking inspiration and prolonged expiration, and lastly, those respirations with abnormal quality and pitch, such as bronchial respiration and bronchovesicular respiration. In bronchial respirations the inspiration is tubular, nonvesicular and shortened. The expiration is tubular, prolonged, of a higher pitch and more intense than the inspiration. In bronchovesicular or the rude, rough or harsh respiration, the inspira-

tion has a combined tubular and vesicular quality in different proportions. The expiration is prolonged, more intense, of a higher pitch than inspiration. In cavernous respiration there is a blowing inspiration and expiration produced by the passage of air into and out of a cavity with flaccid walls. In the amphoric respiration the sounds are similar to that produced by blowing across the mouth of a large bottle; this respiration is found in cavities with rigid walls. The conditions causing these abnormal signs are many, and although these signs in the chest are not absolute proof of tuberculosis, they must, of course, be used in conjunction with the other manifestations in the case.

Adventitious Sounds (Râles or Rhonchi)

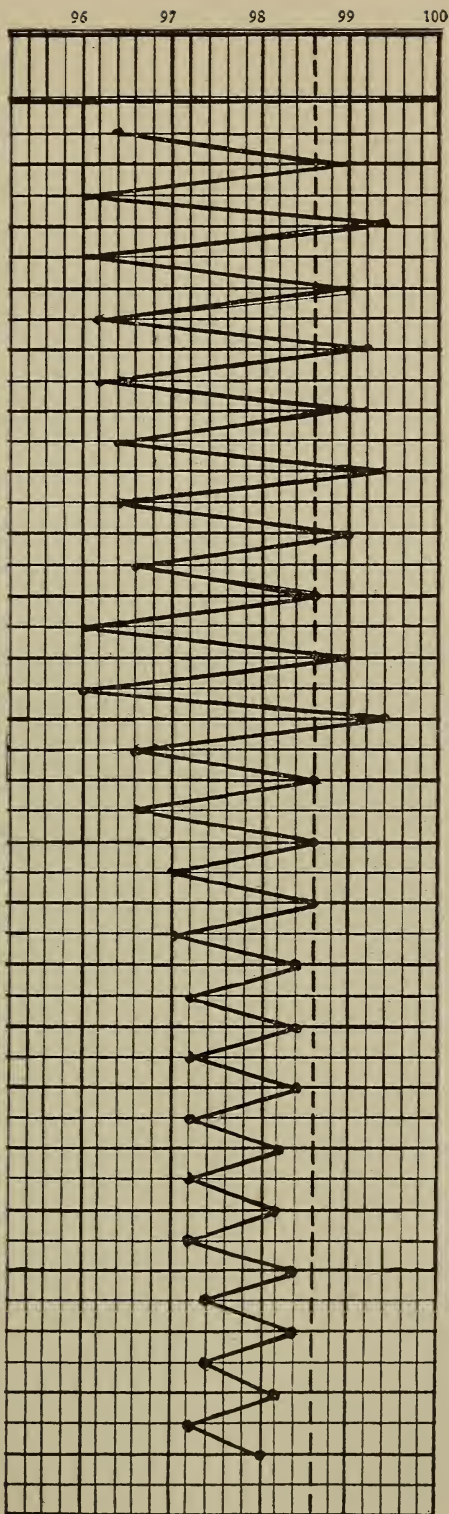
In order to produce râles there must be some foreign substance or abnormal condition of the respiratory tract to act as a partial obstruction to the entrance and egress of air in the tubes and lung vesicles. There are the dry and moist laryngeal râles, the former of which are wheezing or whistling in character, and the latter bubbling; also the bronchial râles, sonorous and sibilant, the former being of low pitch and the latter of high pitch and produced in the large and small tubes, respectively. There are, furthermore, the coarse mucous, fine mucous and subcrepitant râles which differ in character of sound in degree only. The Army Medical

School uses the term "indeterminate" to cover the latter râles. The crepitant râles, which are of a fine, dry, crackling character and heard exclusively near the end of inspiration, are produced in the vesicles and are the symptoms of a circumscribed pneumonic process. The author has found that these râles persist for a long time; hence, they may not necessarily be considered a result of a very acute process in all cases. Cavernous râles are of a hollow, gurgling sound of varying intensity.

Pleural inflammations give many different sounds, according to the pathologic condition present, varying from the fine, crackling râles on inspiration to the rough, squeaking sound of dry pleura during respiratory movements. In nearly all adults one will find fine crackles in the lower axillary region on deep inspiration; naturally, one should be suspicious of tuberculosis in these cases, although the moisture is probably caused by an inflammation due to pressure. I have found this condition especially in shoe workers who have had the shoe or some part of the shoe machine pressed against the chest while stooped over their work, the lung thus not being allowed to work properly.

The healthy voice transmission is variable and depends upon the physical character of the area auscultated. Sound is not conducted through the fat chest as well as through one with less adipose tissue. The diseased voice transmission is very variable. There are diminished vocal resonance

Fig. 2.—Temperature curve in an incipient case showing su bnormal morning and slightly elevated evening fever, also drop of evening fever and elevation of morning fever following the rest treatment.



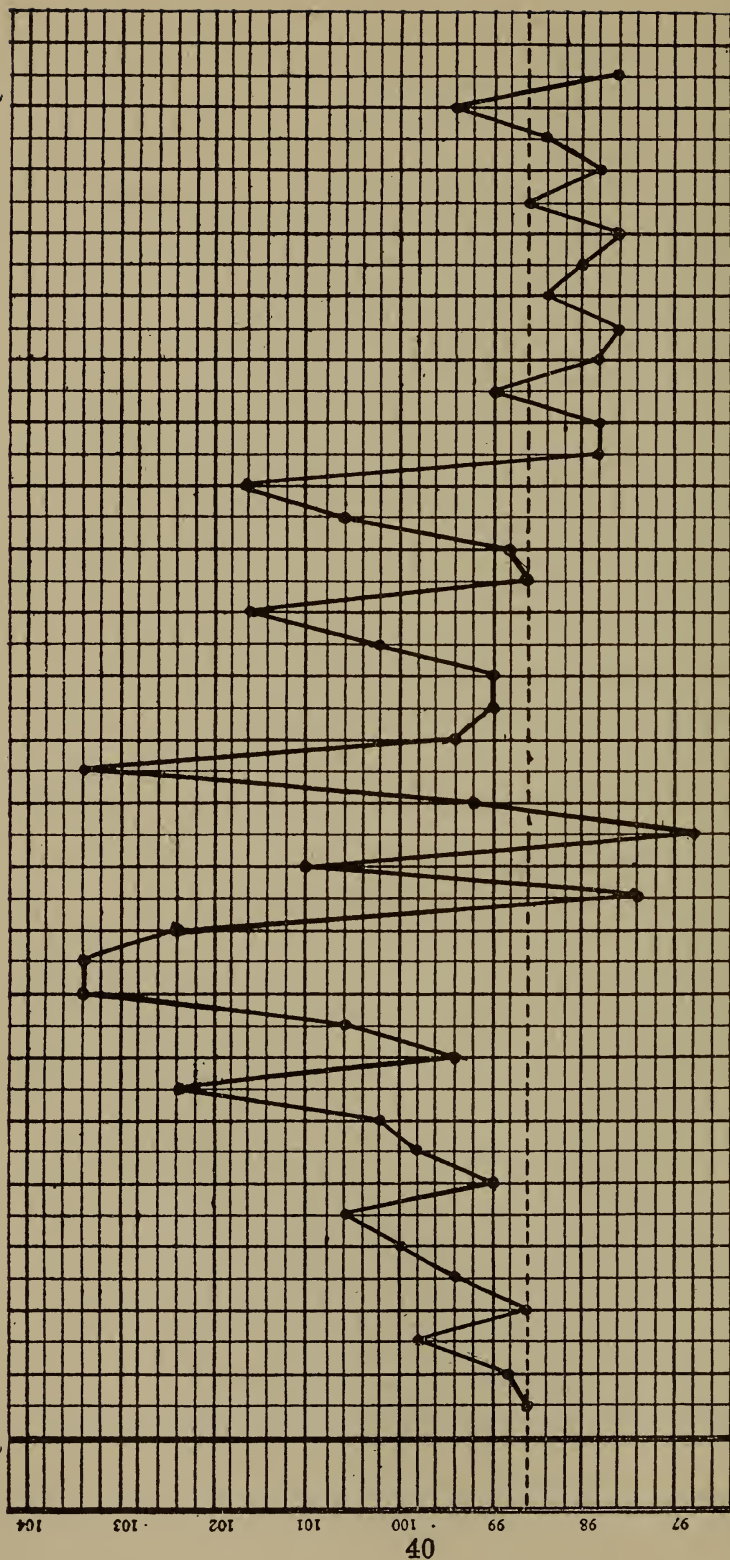


Fig. 3.—Temperature in advanced fibrulcerative case showing “blow-up” with fall in temperature after raising large amount of sputum. Bed patient.

in any condition where the circulation of air in the tubes and vesicles is prevented, and increased vocal resonance resulting from an increased sound reflecting power in the tubes, as in consolidation in some cases. In bronchophony, where the voice sounds seem near the ear a greater solidification than in the above condition obtains. The cavernous and amphoric whispers have the same character of sound as the expiratory sound in the respective respirations and are produced by the same causes. In pectoriloquy there is a direct transmission of sounds to the ear. The condensed lung tissue and cavity formations, resulting in sound reflecting walls, produce this sign.

The common percussion signs in the chest are the normal or vesicular resonance, the abnormal or flat and dull resonance, tympanitic or exaggerated, and amphoric. Actual experience in eliciting these resonances is essential.

Dullness or flatness usually indicates solidification or fluid, and tympany indicates air in the pleural cavity (spontaneous pneumothorax), while exaggerated resonance is usually an indication of emphysema.

CHAPTER VI

CLASSIFICATION OF TUBERCULOSIS

It is evident that any attempt to classify tuberculosis will be fraught with many difficulties when its relativeness is taken into consideration. As has been previously mentioned, an incipient case may be in a worse condition than some of the advanced cases, and, furthermore, the extent of lung involvement *per se* does not give one suitable information on which to base a diagnosis or treatment. Many times a case that would fall under the incipient classification has existed longer than one that would be considered far advanced, due to the differences in treatments, habits and all other factors influencing the resistance of the cases in question, and also to the variation in virulence of different tubercle bacilli. There are many borderline cases in which the classification depends upon the personal ideas of the examiner. It is very necessary, however, to classify tuberculosis after some accepted method of classification, not only from a statistical point of interest, but also so that the superintendents of the different institutions may determine the suitability of certain cases for admission to their different sanatoria, according to

the requirements of these sanatoria for admission. The National Tuberculosis Association has issued a very helpful and interesting booklet for those doing tuberculosis work, which gives the different definitions of terms used for defining the stages and symptoms of the different stages, as well as other practical information.

The following classification is the one adopted by the National Tuberculosis Association as the result of the work by Dr. Rathburn. This classification admits of different combinations of each stage, such as incipient, a, b, c, etc., and gives a more explicit definition of the disease from the standpoint of resistance of the patient or virulence of the infection than did the previous classifications.

ON ADMISSION

LESIONS

Incipient. Slight infiltration limited to the apex of one or both lungs, or to a small part of one lobe. No tuberculous complications.

Moderately advanced. Marked infiltration more extensive than in incipient, with little or no evidence of cavity formation. No serious tuberculous complications.

Far advanced. Extensive localized infiltration or consolidation in one or more lobes, or disseminated areas of cavity formation, or serious tuberculous complications.

SYMPTOMS

A. (Slight or None.) Slight or no constitutional symptoms including particularly gastric or intestinal disturbances, or rapid loss of weight; slight or no elevation of temperature or acceleration of pulse at any time during the twenty-four hours. Expectoration usually small in amount or absent. Tubercle bacilli may be present or absent.

B. (Moderate.) No marked impairment of function, either local or constitutional.

C. (Severe.) Marked impairment of function, local and constitutional.

This schema offers the following combinations: Incipient A, B and C. Moderately Advanced, A, B and C. Far Advanced A, B, and C.

DISCHARGED

A. Apparently cured. All constitutional symptoms and expectoration with bacilli absent for a period of two years under ordinary conditions of life.

B. Arrested. All constitutional symptoms and expectoration with bacilli absent for a period of six months; the physical signs to be those of a healed lesion.

C. Apparently arrested. All constitutional symptoms and expectoration with bacilli absent for a period of three months; the physical signs to be those of a healed lesion.

D. Quiescent. Absence of all constitutional symptoms; expectoration and bacilli may or may not be present; physical signs stationary or retrogressive; the foregoing conditions to have existed for at least two months.

E. Improved. Constitutional symptoms lessened or entirely absent; physical signs improved or unchanged; cough and expectoration with bacilli usually present.

F. Unimproved. All essential symptoms and signs unabated or increased.

G. Died.

It is probable that cases are often considered apparently cured when they are getting absorption from their tuberculous focus, but on account of a developed immunity there is no manifestation at the site of the lesion or in constitutional symptoms, so far as can be determined clinically.

Although it is rare to find a person with a single stage of the disease from the pathologic standpoint, still it is possible to classify a case according to Rathburn's classifications and at the same time consider the pathologic condition in the chest, such as inflammatory or ulcerative, with the sub-

divisions of fibroinflammatory or fibroulcerative. By stethoscopic examination, observation of the sputum and use of the x-ray, these pathologic types can be determined, and this is often of assistance from the standpoint of prognosis as well as in determining the stage of the disease and future treatment.

CHAPTER VII

PATHOLOGY OF TUBERCULOSIS

The amount and character of the reaction of the tissues to the injury produced by the entrance into the tissues of the tubercle bacillus depends upon the virulence of the infecting agent, upon the number of bacilli and the resistance of the infected patient, and upon whether the infection is primary or secondary to another infection of the same nature.

There is probably no other disease which offers so many different phases of the disease process as does tuberculosis. While the formation of the tubercle producing its mechanical wall of defence, as shown by Dr. Allen K. Krause and Dr. Boyd Cornick, is the initial reaction, still we may have in the same lung or even in the same lobe as a result of extension of the disease by continuity or lymphatic extension, inflammation, caseation necrosis, liquefaction necrosis, fibrosis, calcification, and many other degenerations at the same time.

The tubercle bacilli throwing off their tuberculin produce inflammation or caseation according to whether the body cells are able to neutralize the toxins to a greater or less extent by production of antitoxin. There are many factors that decide

whether the fixed and wandering cells will develop their wall of fibrosis and wall off the infection, or whether the bacilli will gain the ascendancy. The main factor is the treatment that the patient receives at this time.

Tuberculin, entering the blood stream, as it does, and circulating through the system, causes anti-tuberculin formation in the different cells. According to Ehrlich's theory the nature of this antituberculin is that they are thrown-off cell receptors that have been produced in excess of the number needed resulting from the reconstruction of the cell following the initial poisoning.

(When the tubercle bacillus enters the system we have a surrounding of the invading organisms by the fixed cells, reinforced by the wandering cells, with resulting fibrosis and healing in cases with good resistance. If for any reason the resistance is poor, the mechanical wall of defence is broken down, with resulting caseation, spread of tuberculin and tubercle bacilli. If all goes well even at this time, we may get a calcification of the necrosed area without surrounding fibrosis.

The caseated area, so called on account of the resemblance of the caseous area to cheese, is a coagulated proteid, resulting from the action of the tuberculin on the cells.

In cases of mixed infection microorganisms reach this area either through the bronchial tubes or blood stream and produce more rapid disinte-

gration of the lung tissue; the purulent sputum results to a greater degree than with the straight tubercle bacilli infection.

At the same time that the lung cells are undergoing necrosis there is an absorption, to a greater or lesser extent, through an imperfect wall of defence, a certain amount of tuberculin, reaching the general circulation, causing the toxic manifestations of the disease.

There is without doubt not a cell or tissue in the body that escapes the action of tuberculin. The action on the brain cells and nerves is manifested by the increased activity and irritability of these cells and on the skin by change of color and feeling. Furthermore, the irritability of the heart, kidneys and skeletal muscles in these toxic conditions is to be noted. The special senses are affected; also the vasomotor centers producing circulatory disturbances.

It is quite possible that by further observation some early sign or symptom of tuberculosis may be developed by considering the irritability of the nerve and muscle fibers.

It has been rather well demonstrated that, as a rule, tuberculosis is primarily a disease of the bronchial or other lymphatic glands, and that with these glands as a base for operation the bacilli proceed by lymphatic extension or eruption into a bronchus or vessel to other parts of the body.

Dr. Mary Lapham has shown the number of enlarged and infected bronchial glands by means of x-ray examination, although naturally it cannot be proved that all these enlargements are due to tuberculous infections.

It has been shown by some authors that from 30 to 90 per cent of all bodies of tuberculous people that have come to autopsy have had an intestinal lesion either primary or secondary to the pulmonary infection. Only a few cases of tuberculosis of the stomach are on record and the same is true of esophageal and nasal infections. It has been shown that from 10 to 20 per cent of all cases have a laryngeal infection of varying degrees of severity. Tonsils have been found infected in a fairly large percentage of cases.

Pleurisy is a very frequent complication, many times being accompanied by effusion. I have frequently found a pleurisy with effusion following a cold or exposure in cases with apparently healed lesions in the lungs and have frequently demonstrated bacilli in the effusion in these cases.

Glandular and bone tuberculosis are not very frequent, occurring more frequently in children. I have remarked the almost total absence of these forms of tuberculosis in the Southwest and their frequency in the Northwest and East. I am sure that the reason for the absence of these cases in the Texas State Tuberculosis Sanatorium is due, to a certain extent, to the almost continual sun-

shine, and probably also to some extent to the good judgment of the superintendent, Dr. McKnight, in admitting early uncomplicated cases.

Tuberculosis in very young babies usually advances rapidly and terminates in a general miliary tuberculosis with meningeal complications. The cellular resistance in the young is not as good as in adults, probably because there have been no previous slight infections.

Tuberculosis of the kidney is fairly frequent, and the experiences of Dr. John B. Hawes with this form of tuberculosis points to the fact that this complication is more frequent than was formerly thought—the case and prognosis more hopeful.

Neuritis is a frequent complication of tuberculosis even in the early stages, and we must consider the possibility of all neuritis attacks as resulting from tuberculous infection.

The blood picture in tuberculosis is variable except that there is usually slight leucocytosis and anemia due to the small amount of hemoglobin, while the coagulability of the blood is also variable. Many cases show albuminuria.

Cavity formation in tuberculosis is at times very beneficial. Closed cases that are absorbing all the products of metabolism of the tubercle bacillus will in some instances eventually rupture this infected area into a bronchus and, following this cavity formation, make good improvement.

Blow-ups in tuberculosis are considered due to extension of the bacilli through the lymphatics. This idea seems to be wrong to a certain extent, since it would be necessary for the bacilli to enter the general circulation and then return to the area in the lungs adjacent to the focus from which they started. It is a well-known fact that tubercle bacilli keep away from the blood stream, and I believe the best explanation of a cavity formation is that a single tubercle may have such a strong reaction that the cells nearby are killed and the surrounding cells are sensitized and the inflammation is increased. If another severe reaction follows, as a result of injection of tuberculin or strenuous exercise, these sensitized cells are destroyed and eventually, if reactions occur often enough, a large circumscribed area of dead tissue ensues, which may liquefy or eventually contain mixed infection organisms, these eventually emptying into a bronchus. In other words, a cavity is formed as a result of tuberculin circulating around sensitized cells. In cases of numerous tubercles coalescing, a very large cavity results. If the above reactions are not severe, the inflammation resulting causes increased fibrosis.

The amount of fibrosis a person has, determines his ability to get over infections of tubercle bacilli, a reaction being occasionally the best thing for a tuberculous lesion, since it increases the fibrosis.

The amount of fibrosis seen in many advanced cases that give histories of repeated reactions, seems to warrant this theory, and the difficult part in causing these reactions is not to overdo them. Koch overdid his reactions by giving tuberculin; others today are doing the same as Koch.

CHAPTER VIII

PHYSIOLOGY OF TUBERCULOSIS

In order that one may treat tuberculosis intelligently and successfully, a knowledge of the normal functions of the body is absolutely essential. One must know the effect of exercise and rest on the diseased areas in the lungs as well as on the symptoms produced by these diseased areas. On the other hand, one must know the beneficial effects of exercise on the body functions in a tuberculosis patient when exercise is indicated.

The physiologic effects of the increased elimination by medicines, exercises, the hydrotherapeutic measures, as well as the effects of different diets, must be thoroughly understood.

Tuberculosis is a disease in which the energy of the one affected must be considered. The decision to reach is whether the patient needs to conserve his energy or to increase the same. The ultimate usefulness of the patient to himself and to the community depends on whether he is advised to exercise at the proper time, developing useless fat tissue into useful muscle tissue, or whether he is ordered to rest, thereby conserving his energy. At the same time that energy is being considered the mechanical effect of increased or decreased activity on the lungs should also be given thought.

The physiologic effects of worry, fright and other causes of increased function of the nervous system are often considerations which determine the prognosis and treatment. Whether it will be best for the patient to lie in bed, thinking, rolling and tossing, or whether he will do better if sitting up or doing some light exercise, should be decided.

The heat of the body must be considered, and the matter as to whether the patient in question needs to go to a warm climate for the winter and how much artificial heat he should use must be determined.

In fact, we must try to approach the physiologic, all the time keeping in mind the fact that the physiologic may increase the pathologic, and that at times it will be compulsory to so treat the patient that the normal functions of the body will be decreased in their intensity.

A brief consideration of the anatomic makeup of the pulmonary apparatus is essential before its functions can be properly understood. The apparatus consists of (1) the air passages—nose, pharynx, larynx, trachea, and the bronchi which communicate with the lungs; (2) the lungs with their immense number of small sacs known as the air vesicles; and (3) the thorax.

We can dismiss the subject of (1) air passages with the explanation that they are lined with mucous membrane which is ciliated in the normal per-

son, thereby assisting in the prevention of foreign substances entering the air vesicles.

The lungs are in the thorax one on each side, separated by the heart and large blood vessels. They are free and attached only by their roots, which are placed near the middle of the lung internally and consist of the bronchi, the pulmonary arteries and veins, the blood vessels of the bronchi, nerves and lymphatics, all invested with a reflection of the pleura. They are closely invested by a serous membrane, the pleura, which at the root of the lung is reflected, covering the inside of the chest wall and forming between these two layers the pleural cavity which, in the normal state, is a closed sac the sides of which rub across each other. When there is a pleurisy these two layers become inflamed and often adhere, causing severe pain on inspiration.

The right lung has three lobes, while the left has only two. The right lung is shorter and a little heavier than the left.

Lung tissue is very elastic and collapses when removed from the chest. The lung assumes its shape in the chest by virtue of the negative pressure in the pleural cavity. It does not move of its own accord, but its movements are influenced by those of the thorax.

Inspiration is voluntary, while expiration is due to the elasticity of the lung tissue and also to the

contraction of some of the chest muscles and diaphragm.

The air vesicles are of chief concern from a standpoint of physiology. As the air passages gradually get smaller and branch off, the bronchi are reached. These bronchi have further branchings until finally each tube is reduced to a diameter of about 1-50 inch, and is called a bronchiole. These bronchioles then open into blind spaces called infundibula which are lined with air cells. In the walls of these air cells there exists a dense capillary network, so that we have an alveolar wall separating the blood in the capillaries from the air in the vesicles. Through this wall, interchange of gases takes place, the oxygen of the air passing through, uniting with the hemoglobin of the red blood cells, and the carbon dioxide of the blood passing through the alveolar wall to be expired.

The blood to the lungs is supplied through the pulmonary and bronchial arteries. The bronchial arteries furnish nutriment for the lung tissue, while the pulmonary arteries supply venous blood from the right side of the heart, which is purified by taking in of oxygen and liberation of carbon dioxide. It is estimated that 6,000 liters of blood pass through the lungs in twenty-four hours.

The lymphatics of the lung are very numerous and are arranged in superficial and deep systems which terminate in the bronchial glands.

If respiration be suspended but a very short time, there will soon be a marked feeling of anxiety, due to the nonsatisfaction of an imperative need. This sensation is considered due to stimulation of the respiratory centers by the carbon dioxide in the blood and it is relieved by introduction of air into the lungs. When the air inspired and retained becomes unfit for further oxidation, there arises another internal sensation which calls for the expulsion of that same air.

These two movements constitute, by their regular succession, a complete respiration and are named inspiration and expiration, respectively. The movements of the lungs are passive, being dependent upon the movement of the thoracic wall. The diaphragm is the chief motive agent in inspiration. This muscle is assisted in its action by the internal intercostals, long and short elevators of the ribs, and the external intercostal. Expiration when forced, has as its causative agents the internal intercostals, the triangular sterni, the two oblique and transverse muscles of the abdomen—*Serratus posterior inferior* and *Quadratus lumborum*.

There are different types of respiration: the abdominal, found among children; the inferior costal, man's type; and the superior costal or clavicular type, which is the mode of respiration peculiar to women. In the abdominal type the respiratory acts are revealed only by the movements of the ab-

dominal wall; in the inferior costal type the respiratory movements take place especially at the level of the lower ribs, beginning with the seventh. Finally, in the superior costal or clavicular type, the respiratory movements are very manifest only about the upper ribs, especially the first. The clavicle also participates in this movement.

Inspiration is slightly shorter than expiration, inspiration being to expiration as 5 to 6. Immediately following expiration there is a slight pause.

Respiratory Sounds

If a stethoscope is applied over the lung at a point some distance away from the bronchial tubes and trachea, a sound will be heard resembling the rustling of leaves in a slight wind. This sound is heard during the whole inspiration and is followed by a short expiratory sound. The inspiratory sound is three times the length of the expiratory and is supposed to arise from the passing of air into and out of the air vesicles, the friction here generating a sound, aided by the sudden dilatation of the air vesicles.

If now the stethoscope is placed over the trachea, two sounds are heard: one during inspiration, the longer, and of a tubular quality, the other during expiration, which is tubular but more intense, and frequently of higher pitch than the inspiratory sound.

In the healthy adult male about 20 c c. of air are introduced into the lungs and bronchial tubes during each inspiration. At each normal respiration of atmospheric air but one-sixth of the air within the lungs is changed. The inspired air contains 20 per cent oxygen, a trace of carbon dioxide, and 80 per cent nitrogen, with a small amount of water and other components in very small proportions. Expired air contains 16 per cent oxygen, 4 per cent carbon dioxide, and 80 per cent nitrogen, as well as a variable amount of water. Heat leaves the body, to a great extent, by way of expired air.

In the adult the number of respirations per minute may vary from sixteen to twenty-four. The heart usually beats four times during each respiration. In the recumbent position there are usually thirteen respirations per minute, and nineteen and twenty-two respirations per minute respectively in the sitting posture and while standing.

During infancy and childhood the number of respirations is always greater than in the adult. Exercise increases respiration, both as to number and depth. Respirations are increased during fever or as a result of pleurisy, pneumonia, some heart diseases and anemia.

A sigh is a form of respiration, reflex in character, due to accumulation of venous blood in the right heart. Emotions of sadness in their effect on oxidation of the blood explain the sighing during these emotional states. The yawn differs from the

sigh in its mechanism, but its cause is due to needs of oxidation of the blood. The sigh may be voluntary. The hiccough is a spasmodic contraction of the diaphragm, with coincident contraction of the glottis.

Coughing results usually from an irritation in the laryngeal passages. The so-called stomach cough for all practical purposes does not exist.

Laughing and sobbing act especially upon the diaphragm. Snoring is due to a vibration of the soft palate, and occurs more frequently in people who sleep on their backs and in very fleshy people.

The interchanges of gases at the alveolar wall is termed external respiration, while the chemical changes in the tissues are called internal or tissue respirations. The oxygen, in tissue respiration, passes from the hemoglobin to the plasma, then to the lymph, and from the lymph to the cells of the tissues. The carbon dioxide goes from the tissues to the lymph, then to the plasma of the blood. The exchange depends upon the law of "dissociation of gases."

Exercise increases the formation of carbon dioxide and other products of metabolism. At the same time that oxidation is increased the amount of blood to the organs is also increased, and, as a result, more energy in the form of heat and power to do work is formed. Exercise develops useless fat into muscles and, by increasing the elimination

of carbon dioxide, increases, at the same time, the appetite.

The action of the eliminative and digestive organs is intensified by exercise.

In the case of the tuberculosis patient who has an active lesion, exercise by increasing the activity of the inflamed organ increases the inflammation, at the same time causing by increased circulation, a flushing out of the infected areas and a scattering of the disease. If the exercise is slight and the muscular contractions not too rapid, a slight reaction occurs in the cells of the body in general, as well as at the site of the tuberculous lesion. The slight reaction around the tubercles promotes fibrosis, while the cellular reaction develops the antibodies to tuberculin.

The effects of abnormal nerve excitants, such as worry, fright, anger and home-sickness, are very marked in the tuberculosis patient whose nerve cells are overstimulated by toxins. Rapid respiration and circulation, vasomotor circulatory disturbances, and interference with the normal functions of the digestive organs frequently follow these excitations.

X The will, the normal excitant of the nervous system, plays an important and often decisive part as to whether the tuberculosis patient will live or die. Will power is apparently increased by suggestion. The determined patient who controls himself makes the most improvement.

The heat regulating centers of the nervous system control normally the heat reaction of the body. In tuberculosis, before immunity is developed, there is an increased heat production in the body and overstimulation of the heat centers, with elevation of temperature. If the toxemia is marked, as in the last stages of tuberculosis, the sweat glands are stimulated to activity and the "night sweats" occur, ridding the body of toxins and at the same time cooling the body by evaporation.

On account of the development of antibodies to tuberculin and tubercle bacilli it is possible to have active tuberculosis without an exhibition of fever.

Tuberculosis patients often lower their temperature by exercise. This condition is probably due to an increase in heat radiation.

Warm baths stimulate the circulatory system and increase the activity of the skin. Cold baths, if of short duration, stimulate the skin and superficial blood vessels. If, however, the cold bath is prolonged, it results in a contraction of the superficial vessels and has a bad effect.

Lying on the right side after eating helps digestion by promoting peristalsis. Fruits and vegetables also promote elimination. Sodium phosphate, by its action on the liver cells, increases the elimination of bile. The use of two or three quarts of water daily helps to flush the system. Fats, carbohydrates and proteids are all needed in the reconstruction of the tuberculosis patient. At

times, on account of weakness, or digestive disturbances, a milk diet is necessary and has given excellent results in very weak cases. Oil rubs are very efficacious in very poorly nourished patients. Each case of tuberculosis, being a case unto itself, demands special treatment to be decided upon by the merits of that particular case.

CHAPTER IX

TREATMENT OF TUBERCULOSIS

Broadly stated the treatment of tuberculosis should be that which most nearly approaches the physiologic. In general, we must treat the disease process itself as well as the individual.

There are two classes of cases to be considered: the hopeless, incurable case and the case that gives some hope of an arrest of the disease. The treatment of the hopeless, incurable case in which none of our adjuvant treatments is indicated, is to make the patient comfortable and at the same time remove all possibilities of his infecting his relatives and friends. The advanced case of this type needs a great amount of nursing. Resorting to the use of opiates should be delayed as long as possible, because frequently opiates prolong the life of these hopeless incurable cases, who have an impaired mind which causes them and their associates much discomfort.

Frequently the apparently hopelessly incurable case deceives the physician and gets better. On the other hand, as a result of the development of unforeseen complications, the apparently hopeful case becomes hopelessly incurable. This condition may result from a ruptured lung and its sequelæ, or from hemorrhage producing a caseous pneumonia;

or from the ruptured tubercle into the blood stream, producing miliary tuberculosis. We often see these complications arise and are reminded of Dr. Allen K. Krause's statement regarding the accidental death in tuberculosis.

In the treatment of tuberculosis we must use nature's processes of rest, fresh air, food, sunshine and optimism. The amount of rest must be qualified according to the demands of the case. We must realize that it is the physiologic which we are striving for regarding the food, fresh air and sunshine, while rest has for its object conservation of energy and decreased activity of the infected area, with resulting decrease in inflammation or ulceration, as the case may be. At the same time toxemia is being diminished by decreasing the amount of poison-loaded blood from leaving the infected area and also decreasing its rapidity of the flow by resting the heart.

It is impossible to particularize on rest or exercise when considering patients collectively, and specialists of today do not consider the rest treatments in the same light; some believe in prolonged rest regardless of the symptoms and others take a more radical view and believe in approaching the physiologic. One cannot go by the temperature or cough alone in deciding on the amount of rest and it is only by a consideration of all the factors in the case, and then a consideration of the object sought, that one can decide the amount of rest or exercise

which is best for the case; and even then mistakes may be made, and often the physician is put to the greatest test to ascertain what a patient can do.

The general practitioner should rely on rest in the treatment of his cases, and after consulting with the specialist he can determine when to exercise his patient and to what extent. The object of rest is to conserve energy and to rest the affected lung. The object of exercise is to produce normal functions of the body, but not to the extent of increasing the pathologic conditions. Having the patient lie on the affected side is a great help unless it causes an undue cough. Binders and adhesive strips often help, not only a pleuritic condition, but also the disease process itself by mechanically resting the part.

Rest decreases the cough and sputum, stops night sweats, decreases the pulse and temperature, conserves energy, relieves the poisoned mind and promotes fibrosis. Exercise at the right time increases the appetite, converts useless fatty deposits into useful muscle tissue, increases elimination and oxidation, and in the proper cases gives the patient a different mental attitude, which is often the deciding factor in the future course and termination of the disease.

Some authors do not believe in the use of blood and general tonics, and this to a great extent seems correct. However, the use of iron is, I firmly believe, indicated, and my experience has been that

iron administered hypodermically is to be preferred both for its physiologic and psychologic effects.

In the cases with marked nervous irritability use of bromides is necessary not to mask the symptoms but to use as an adjuvant to Nature's processes.

It is extremely difficult to decide in many cases just how to approach a patient regarding his condition. The best policy to follow is to be absolutely frank with those whom you think can be helped by treatment, so that they will not in their ignorance do away with their own chances of becoming cured by unconscious harmful acts. It is best to hedge a little with those you think will die, but as regards their relatives it is best to tell the truth, as near as possible.

Optimism is absolutely essential for the tuberculosis patient; and a little talk, with explanation of the different phases of the disease, will act like a powerful tonic, both physically and mentally. Many good results obtained in tuberculosis are due to tactful and diplomatic nurses. A nurse who has had tuberculosis, if well enough, makes the best nurse, as a rule, for the tuberculosis patient.

The hospital treatment of the tuberculous has for its object the isolation of the patient, because of his being a focus of infection, and the care and comfort of the individual. The sanatorium treatment should have for its aim the education of the patient and not his cure, since it is impractical for a tuberculosis patient to stay in a sanatorium until

cured. Sanatorium life is abnormal and the patient gets into a rut if he stays too long. However, the patient should stay in a sanatorium until he develops the "habit" and gets his bearings. It is also best for him to get a certain amount of exercise under the supervision of the sanatorium physician. There are other unfortunate complications, which need not be touched upon: natural perhaps, but nevertheless to be avoided for one who stays too long in a sanatorium.

We are often called upon to treat the symptoms in tuberculosis to the utter disregard of the disease process itself. By such treatments we often mask the symptoms and increase the disease, but at times it is necessary to treat the symptoms in a given case though not losing sight of the disease process and the value of rest, fresh air, food, sunlight and optimism. These symptoms, as a rule, are cough, pain and hemorrhage, for all of which we must, in addition to our medical treatment, prescribe rest.

If a patient has a more or less incessant cough, not due to throat irritation, which can be remedied, and the cough is not productive, some very mild sedative should occasionally be given until the physiologic effects of rest have caused a removal of the cause. The type of cough with profuse expectoration needs some medicine at times to decrease the sputum and at the same time relieve the cough. Elixir of heroin and terpin hydrate are very useful remedies for this type of cough, as

heroin relieves irritation and terpin hydrate decreases expectoration without increasing the inflammation, as do the iodides. The type of cough which is productive after much effort, needs some of the so-called expectorant treatment, and the ammonium salts work very well in these cases. The mistake that the physicians often make, is to allow their patients to take medicines for cough continually for weeks on end, instead of trying them out at the end of a week without medicine.

About 90 per cent of the cough in tuberculosis is probably unnecessary, but is the result of a developed habit in the patient. The patient can be educated to stop a large amount of this and at the same time be taught to cough properly, that is, to cough at the end of expiration, thereby relieving the strain on the distended lungs, which follows a cough during inspiration. It is remarkable what prompt relief from coughing results when a patient is put at rest in the fresh air. The dry climates are wonderful in their effect on cough, and I have often remarked the small amount of cough in patients in the Southwest as compared with the cough of patients in the East and Northwest.

Hemorrhage from the lungs in the tuberculous is a symptom which often is as alarming to the physician as to the patient. It is necessary to recall the conditions causing hemorrhage in order to treat it successfully and intelligently. There is the hemorrhage due to ulceration of the side of a blood

vessel that is of greater or lesser size. The hemorrhage in this case corresponds with the size of the rupture as well as with the size of the vessel. Rest in bed will usually stop this type of hemorrhage, but it may be necessary to give some sedative to allay the cough and stop nervousness. The so-called toxic bleeding, where there is an occasional bright streak of blood intermingled with mucus, needs only rest in bed for a few days, depending to a great extent also on the other symptoms, as well as upon the persistence of the streaking.

The profuse hemorrhage in cases where there are ruptures of aneurysms in cavities usually is not amenable to treatment, since the patient is asphyxiated in a short time, sometimes even before the doctor is called. Most of the cases of this type which I have seen, have cried out in a shrill tone before the hemorrhage. I do not recall but one case of what was probably a ruptured aneurysm, which recovered from the hemorrhage, although a few cases have lived for a few days by being turned so that the blood would run out of the bronchial tubes and air allowed to enter. Inhalations of amyl nitrite can be used in these cases if one gets a chance to use it. There is another type of bleeding in which a cavity is gradually and slowly filled with blood from proliferated blood vessels that have ulcerated at their ends in the cavity walls, and this type of hemorrhage needs only rest. If there is a persistent bleeding with a large loss of blood, which

loss may be slow or rapid, artificial pneumothorax is indicated, if the bleeding point can be determined. It has given good results in many cases.

A number of medicinal agents have been given routinely in hemorrhage and it is possible that there are as many different treatments for hemorrhage as there are specialists on tuberculosis. Some resort to the use of morphine as a routine treatment; others believe in the use of large doses of atropine hypodermically; and good results have been reported following the hypodermic use of this remedy in doses of as large as $\frac{1}{25}$ gr., repeated every six hours. Emetin and nitroglycerine, as well as the nitrites, have been used. Different agents to increase the coagulability of the blood, such as lime salts, and normal serum, have been used with varying degrees of success. It was formerly thought that it was necessary to reduce the blood pressure, but in a recent series of cases in which I was interested, it was found that the blood pressure was the lowest before hemorrhage and highest following stoppage.

In treating hemorrhage the physiologic effect of nervousness on the heart and lungs should be taken into consideration, and every possible method should be made to quiet the patient.

A hemorrhage patient should be put to bed with clothing loosened or removed, with as little disturbance to the patient as possible. The patient is usually very nervous and wants the doctor. He

must be assured that if he will do as told, the hemorrhage will stop. He must be encouraged and his nervousness must be overcome, sometimes by the use of a sedative. I prefer as a sedative, $\frac{1}{4}$ gr. of codeine given hypodermically. The application of an ice bag to the heart region is also a great help, as well as the administration of a sedative the dose of which depends upon the individual case. It is almost criminal to start such cases out, as a routine, with a large dose of morphine. Posthemorrhagic pneumonias have been attributed to the retention of secretions in the bronchial tubes, resulting from the paralyzing effects of morphine on the reflexes in these tubes. Even though these posthemorrhagic pneumonias could be proved not due to the effects of morphine, there is evidence enough against morphine as a routine treatment, in its effect on the normal functions of the body, to cause it to be discarded. There are many patients, however, particularly nervous patients, who will tear the rupture in the blood vessel wide open, if not given a large dose of sedative. In such instances we must choose the lesser of the two evils.

Magnesium sulphate should be given both for its eliminant effect, and also for its effect in increasing the coagulability of the blood. The physician must use good common sense in giving magnesium sulphate. It should not be given immediately to a patient who is already nauseated or to one who has just had a heavy meal. In fact it is best to wait

a few hours, at least after hemorrhage, before giving the salts.

After one has seen many cases of tuberculosis, many of them of the hemorrhage type, one is impressed with the idea that probably almost all hemorrhages which stop with medicinal treatment would stop without it, if the patient is put to bed, reassured and encouraged. Diet in hemorrhages has received much attention. From a practical standpoint it would seem best not to give too much food to hemorrhage patients, and nothing hot, indigestible, or of a makeup that would increase cough. A small amount of very easily digested food, not hot, will suffice, and sometimes it will be best to give only fruit juices for a short time. Grape juice, being of a high caloric value, is good.

When to allow the patient to get out of bed following hemorrhage, is to be determined by the use of common sense and the experience gained by observation of previous cases. It is best to wait at least five days after all bright hemorrhage has stopped, and the getting up should be very gradual, depending upon the strength of the patient. The patient should at first try to turn from one side to the other if the hemorrhage has been enough to compel absolute immobilization, and then gradually sit up in bed.

Pain in the chest is often a troublesome symptom in the tuberculous, not always because of the amount of physical suffering, but sometimes more

on account of the psychic effects that it has on the patient. The patient will mention it because he wants to be reassured that he is not getting worse; and he will usually say that it does not bother him enough to have anything done for it, after he has been told that it is only a slight inflammation that will subside and perhaps help his healing process. Other cases of moderate severity need some relief, such as is obtained from the use of the hot water bag or iodine; still others, who have an adhesive pleurisy with the sharp knife-like pains, need to have the chest immobilized. Adhesive plasters and binders applied tightly are a great blessing in this form of pain. It is sometimes necessary to give a narcotic to these patients, as well as to strap them. Having the patient lie on the side where the pain is located, will often relieve the pain due to rubbing of the inflamed pleuræ, because it stops the motion and rests them.

Dr. John B. Hawes suggested the probability of pain in the chest being due to the mechanical effect of pressure on the nerves in a process of healing. It is possible to get a burning sensation in a lung free from disease as a result of circulation of tuberculin from the sick lung to the sensitized cells of the well lung, especially following exercise. This phenomenon is similar in its reaction to the cutaneous skin test, in which case there is an inflammation with all its cardinal symptoms, in a

group of cells that are well, although sensitized to tuberculin.

Patients often come to me with a story of a diagnosis, by their doctor, of tuberculosis on the right or left side, and examination shows the greatest amount of trouble to be on the opposite side. Further questioning brings out the fact that the patient had complained of pain in the lung in question, and the physician had diagnosed the trouble as being in this certain lung, presumably from the subjective symptoms. This is, to a certain extent, as it should be; and it is to be hoped that the physician of the future will continue to consider these and other subjective signs, and not rely too much on the stethoscope and microscope.

In treating any symptoms of tuberculosis we should try to avoid the use of medicines as much as possible, and rely more on treatments which will act physiologically and mechanically in removing the disease and its cause. Many drug addicts blame their weakness on the use of morphia in the treatment of a previous tuberculous infection; it is convenient to have someone to blame for our faults. Seriously, this is probably a true picture, to a certain extent, of conditions as they exist, and care should be taken that such complications do not occur in the future.

Night sweats are at times troublesome symptoms of tuberculosis to overcome, but rest, by decreasing the toxemia, decreases this symptom. We are re-

mind of the old treatment of placing a pan full of water under the bed and going to bed as a remedy for night sweats. This perhaps was based on actual experience; but instead of rest getting the main credit, the water under the bed was considered the agent causing this mysterious relief. At times it is necessary to resort to hydrotherapy in the treatment of night sweats, for which an occasional dose of atropine is very efficacious.

The tuberculosis patient must have good elimination, and the use of natural laxatives, such as bran, mineral oil, fresh and dried fruits, is to be strongly encouraged, as well as an occasional dose of castor oil. Sodium phosphate, by its action on the liver, is a very necessary medicinal agent in the tuberculous, who, through sedentary habits and a diet rich in carbohydrates, has a sluggish liver.

Gastrointestinal disorders need attention quite frequently, and often a patient's digestive system needs rest after being clogged with food by the patient, who thinks he must stuff to get well. It is well to treat these disturbances with rest, giving a small amount of milk for a day or so, in conjunction with other medicinal agents which may be indicated.

The physician who will use just as little medicine as possible, with as much encouragement and good sound advice regarding the use of Nature's processes of rest, fresh air, optimism and sunshine, will get better results than the one who is continu-

DAILY RECORD SHEET

Month of.....192

Name

Address

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Fig. 4.

ally using any remedy that comes on the market that has not been approved by the American Medical Association or the National Tuberculosis Association.

Instructing the patient in regard to the history, diagnosis, prognosis, prevention and treatment of the disease will help him wonderfully, and will also refresh the physician's mind on the different phases of the disease. Furthermore, it also instils confidence in the physician.

A patient who takes a few months' treatment, and is not responding as he should, needs the advantage of a consultation with a specialist, who can often recommend some special line of treatment or some change in his present treatment. Such special treatment may be artificial pneumothorax, tuberculin, vaccine, or surgery. Such special treatment should be administered by the specialist or given under his direction.

CHAPTER X

TREATMENT OF COMPLICATIONS IN TUBERCULOSIS

The treatment of nontuberculous complications in the tuberculous is, as a rule, the same as for these conditions in the nontuberculous. However, it should be the object of the physician to conserve the energy of his patient in every way possible and to avoid undue shock. Tuberculosis patients with simple colds should be treated with bed rest during such attacks, because often these colds untreated in this way have apparently increased the activity of the tuberculous infection. This has been shown to be true, especially during the epidemics of influenza. Anesthetics should be used sparingly. Ether has apparently been the cause of many deaths in tuberculosis patients.

Tuberculosis of the bone and joints needs rest, preferably by the use of the plaster jacket, and these cases should also be under the expert attention of the orthopedist. Heliotherapy should be used, especially in open cases.

Glandular tuberculosis sometimes demands surgical interference, but radical operations would seem best to be avoided. A few such cases have made great improvement under tuberculin treatment.

The use of tuberculin has yielded good results in renal tuberculosis. Dr. John B. Hawes, who has had a very wide experience in this form of tuberculosis, is very enthusiastic in its use and his results surely justify his enthusiasm. Surgical interference is at times very necessary in these cases, as a rule, due to delayed diagnosis. Recent post-mortem reports seem to prove that these infections heal spontaneously more often than we formerly imagined, and that this may also be the case in liver and meningeal tuberculosis.

Asthma is a frequent complication of tuberculosis, especially in tuberculous women at the menstrual period. Autogenous vaccines have apparently been of some help in overcoming these conditions, after all possible focal infections have been eliminated.

Tuberculous pneumonia, while usually running a rapid and fatal course, does in some cases settle down to a chronic process. I have treated such cases with artificial pneumothorax with good results.

Pleural effusion is often a troublesome complication and one which is often difficult of treatment. If, however, dyspnea, pain in the chest or displacement of the heart is marked, removal of the fluid by aspiration is indicated, and one feels well repaid for the interference when he sees the marked relief that it affords these cases. I have often instilled one-half as much air as fluid removed in such cases.

This was done to keep the pleural surfaces separated and also to support the lung. About 20 per cent of my cases treated by artificial pneumothorax developed a pleural effusion which, in a few cases, became purulent.

Empyema should be treated by withdrawal of the fluid at different intervals, and by washing out the pleural cavity with some of the antiseptics which the army surgeons have found effective. I believe that rib resection has been resorted to too often in some of the serious cases, and that aspiration would have been more satisfactory.

Peritoneal tuberculosis is often cured spontaneously, but in cases of extreme pressure, opening of the abdomen and draining are usually all the treatment that is necessary.

Intestinal tuberculosis, surgically treated, has not given promising results. These cases usually do well, with the exception of the interference in the bowel function, and of some pain when the bowel contents pass over the inflamed area. I believe this sensation in the intestines is often more annoying than painful, similar to the pain in the chest. If a person's resistance is good, the mechanical walling off of the focus proceeds satisfactorily, and if the cellular resistance is poor we get ulceration with all that that entails. It has been shown that tuberculosis of the intestines occurs as a primary or secondary condition in from 30 to 90 per cent of all cases of pulmonary tuberculosis. The

treatment is really expectant and symptomatic, according to whether there is diarrhea, constipation or pain accompanying the affection. The diet must be of a very digestible nature, and preferably not too much liquid. Bismuth preparations, iodoform, and the astringents have been used, both in combination with opiates, and alone.

Spontaneous pneumothorax is a rather infrequent complication of pulmonary tuberculosis. The diagnosis, prognosis and treatment of this condition depend upon whether the pneumothorax is complete or partial, and whether the opening in the rupture area is valvular or whether it has closed. The partial pneumothorax is the result of adhesions limiting the escape of the air into the pleural cavity, and is therefore localized. If the opening is not valvular, the prognosis is good and the treatment is rest. If there is a valvular opening, it is often necessary to withdraw the air, in left-sided cases especially, where there is much discomfort and heart displacement. In the complete type, with a valvular opening, a very troublesome complication occurs especially when the rupture is on the left side. I have seen six cases during the last ten years. It is quite possible, and probable that I have overlooked some partial ruptures, especially in the far advanced, where, on account of adhesions, the rupture did not produce much discomfort. The following is a brief history of these cases:

CASE I.—Male, moderately advanced case, upper two-thirds of lung infected, and scattered areas in right. Complained of sharp pain in left lung at the top; appeared very nervous, dyspneic, and was cyanotic. Examination showed complete valvular pneumothorax, left side, with heart pushed entirely over to the right chest. Patient died two days later.

CASE II.—Female, advanced case, both lungs entirely infected. During a coughing attack she experienced severe pain in the right lung; was very nervous and short of breath. Patient died in twenty-four hours. Examination showed right complete pneumothorax.

CASE III.—Male, advanced case, right lung entirely infected, with area scattered in left. After a severe coughing spell he expectorated a small amount of bright blood, and complained of severe pain in the right chest. Patient very nervous and short of breath; temperature and pulse elevated. Examination showed complete pneumothorax of the right side. Patient gradually improved, but six months later developed an empyema, which eventually resulted in death.

CASE IV.—Male, moderately advanced case, upper two-thirds of right lung infected; left lung contained a few scattered râles. After a severe coughing spell patient complained of severe pain in the right chest; was short of breath, with elevated temperature and pulse, and marked nervousness. After a few hours patient had developed a subcutaneous emphysema of the upper part of the body on the right side, with marked dyspnea. Examination showed a complete rupture, with a valvular opening, on the right side. A large cannula and trochar was inserted over the rupture and the chest bound down, leaving the cannula in place. Patient made good improvement, but developed empyema which still stays with him.

CASE V.—Male, moderately advanced, left lung with scattered infection throughout, with a possible cavity in the lower third. Right lung showed a few scattered areas of infection. After a severe coughing attack, patient experienced a severe pain in left chest in the area of possible cavitation; was marked by dyspneic, and nervous, with elevated temperature and pulse. Examination showed left pneumothorax with probable valvular opening. Air

was removed at different intervals. An effusion developed and was withdrawn. The pleural space was partly filled with air to take the place of the fluid withdrawn, and also to keep the mechanical pressure on the opening until it was healed. Patient did well; and one year after the rupture is attending to his usual duties as a clergyman.

CASE VI.—Male, moderately advanced, both lungs affected in upper half. After a severe coughing attack developed sharp pain in the left side, with marked shortness of breath and cyanosis. Examination showed a complete rupture of the left side with a valvular opening. Air was withdrawn at intervals, and the patient is doing well.

In withdrawing air I found it best to withdraw as much as possible and not go by the manometric readings, since these cases often show marked negative pressure and at the same time are very uncomfortable. The first few cases that were cited occurred a number of years before the artificial pneumothorax apparatus was very much used, while the last were treated by withdrawing the air by reversing the apparatus. The cardinal symptoms in these cases were severe pain following cough, marked shortness of breath and nervousness, sudden elevation of temperature and pulse, with the distention of the side where the rupture occurred, and marked tympanitic resonance on percussion.

Laryngeal tuberculosis complicates pulmonary tuberculosis in 10 to 20 per cent of the cases. Many physicians do not believe in treating the laryngeal complication except by rest and general building up of the body. Rest is very important, and it is

necessary to keep the mucous membranes clean by some spray, such as Dobell's solution, especially where there is an ulcerative condition. Argyrol is a useful application in the inflammatory stage, as is also menthol in olive oil, Lugol's solution and a few others. Phenol in a 1 per cent solution, formalin in from 1 to 10 per cent solution, lactic acid in from 20 to 70 per cent solutions, have all given good results in the ulcerative forms. It is necessary, as a rule, for a throat specialist to diagnose these cases, because the general practitioner is often not accustomed to the examination of the larynx. Every case of pulmonary tuberculosis should have a throat examination at intervals, and if infected, should be treated. The physiologic effects of these throat treatments are to be desired even though nothing else results.

It is generally recognized that when a person has one or more infections, one may influence the other occasionally, to the apparent advantage of the patient, but more frequently the opposite results. Vaccination has often lit up tuberculous infections. Focal infections, in a great many cases, apparently prevent a rapid recovery from tuberculous infection until removed, when a speedy improvement results. I have noticed that following influenza, patients, who have tuberculous infections, and who have had a von Pirquet test, would show a reactivation of the area which was the point of election for the skin test, and that this occurred frequently

as long as six months following the test and immediately following and during the influenza attack.

According to autopsy reports, there have been many cases of meningeal infections in tuberculosis, which have not resulted in death, but which have spontaneously healed. Young children invariably have tuberculous meningitis following infections in the lungs, in the cases that have a fatal termination. In the young children with meningeal tuberculosis there is usually a certain length of time during which the child is out of sorts. This period is followed by one with more marked symptoms of elevated temperature and rapid pulse, projectile vomiting, and marked restlessness, especially at night, when the child cries out. The child will place his hand over the region of the head where the pain is located. Convulsions with temporary hemiplegia are often the first definite symptoms.

Older patients complain of a localized pain in the frontal or parietal region. This pain is not relieved by any treatment. There is at the same time elevated temperature and rapid pulse, marked photophobia and stiffness of the muscles in the back of the neck. Kernig's sign, and paralysis of the rectum and bladder reflexes follow. Lumbar puncture has apparently cured some cases of meningeal tuberculosis by relieving the pressure.

CHAPTER XI

EXERCISE AND REST IN TUBERCULOSIS

Exercise and rest are two of the most important measures to be considered in the treatment of tuberculosis. There is probably no other agent in the treatment of tuberculosis which has caused as much harm, when wrongly used, as has exercise. On the other hand, when used properly, exercise at the proper time has been more beneficial than has rest.

There are no general rules to be gone by in prescribing rest and exercise which will apply to every case. However, the physician must have some guide in prescribing these remedies, and at times he will be compelled to go a great deal by the patient's statements; but he must be equally careful in using good common sense, based on his knowledge of physiology and the pathology of tuberculosis.

The object of rest is to conserve energy, decrease the function of the affected organ, and decrease the rapidity of the heart beat, thereby decreasing the output of toxins and bacilli from the active foci and decreasing all symptoms of the disease by decreasing the activity of the foci.

The object of exercise is to increase elimination, to convert useless fat into useful muscle tissue and to increase oxygenation of the blood. In short, we must exercise to be normal.

It has been shown that a position of the patient with the body at an angle of 30 degrees to the legs produces the most complete relaxation. Some authors today believe in prolonged bed rest in the treatment of tuberculosis. It is not a good idea to have a patient, with very little signs of activity, lie in bed and get fat and lazy. I have seen a few cases where the physician has had his patient lie in bed absolutely, until he was so weak and fat that it took many weeks of graduated exercise to undo the harmful effects of the prolonged rest, so far as its effect of weakening the heart muscle was concerned. A physician, as I have mentioned before, must use common sense. At times a patient can rest much better by sitting up in a chair than by lying in bed, nervously tossing from side to side.

As a rule, it is not the work or exercise that a patient does, but the way he does it, that determines whether the results will be good or bad.

A patient must exercise slowly, being careful not to cause rapid respiration or rapid heart action, and not get overtired. A tuberculosis patient, if slightly toxic, needs a guardian, since he is very nervous and will invariably overexercise. A little exercise of the body will often relieve wonderfully an overexercised mind, but in cases of extreme nervousness, absolute rest and quietude are necessary.

Patients should rest before and after each meal for an hour, and they should relax at meals as much

as possible, so that they can give proper attention to their eating.

Patients should be given their exercise in graduated doses. That is to say, if a patient has been absolutely in bed, he should be allowed to sit up gradually before attempting any walks. If patients are very weak, they should at first take only a few steps at a time, and gradually increase their walking according to their condition.

A great many cases of tuberculosis are accidentally discovered, and very many of these cases are not active and do not need absolute and prolonged rest, but do need instruction. The fact that a patient has tuberculosis does not make it necessary that he be made to lie in bed for six months, unless there are some indications for the rest. It is suicidal, on the other hand, for a patient to "go West and rough it," providing he has symptoms of activity. The doctor advising such treatment is committing a crime.

Patients entering the Texas State Sanatorium are put to bed, except for meals, if their temperature and pulse are under one hundred, and if they do not have a severe cough, spitting of blood, shortness of breath, marked weakness or other toxic symptoms. If they do have the above symptoms they are allowed to get up only for the bath and toilet. If patients have been taking quite a bit of exercise before entering the institution, and if they have no marked symptoms of activity, they are

soon given fifteen minutes of exercise, twice daily, and are allowed to sit up except for two hours in the morning and four hours in the afternoon, which time is spent in bed with the patient undressed and relaxed. During the afternoon rest hour no communication between patients is allowed.

Friday is set aside as order day, and each patient is questioned regarding his general condition; that is, whether he feels rested or not, and also regarding weakness, increase in cough, expectoration of blood, pain in the chest and nervousness. If he gives a good report, and his temperature and pulse are normal, he is allowed a little more exercise once or twice a day and a little more sitting-up time.

Graduation of exercise must be carried on slowly, and it is often necessary for a patient to be put back to rest.

Visitors to tuberculosis patients are very harmful and should be limited to as few as possible, and these should be told to stay only a few minutes.

There are few general rules that can be considered regarding the use of exercise. They are as follows:

1. None if temperature is above 99° F.
2. None if blood in sputum.
3. None if loss of weight is persistent.
4. None if pulse is rapid after a few attempts at exercise.

5. Never get out of breath.
6. Never get overtired.
7. Never strain the body lifting or running.
8. Go slow.
9. A persistent tired feeling calls for more rest.

CHAPTER XII

CLIMATE IN TUBERCULOSIS

A physician treating tuberculosis patients is often asked concerning a change of climate for the patient who is not doing well. In order to envisage this subject intelligently, it is necessary to consider what effect climate has on the body and whether the dry climate effect is to be desired or the cold climate effect.

Climate is the sum of all the meteorologic conditions of a locality. The nearness to bodies of water, the latitude and altitude, and prevailing winds enter into consideration; also the amount of rainfall and sunshine.

The physiologic effects of a hot climate are to increase the activity of the skin and liver, to stimulate the nervous system, and to cause a sluggishness of the muscular and digestive systems.

Cold climate stimulates the muscular and digestive systems.

In the treatment of tuberculosis, climate has had a varied consideration as to its value, and, in the absence of correct data on which to base our ideas regarding its value, it seems that this question will still receive varied answers. The most unfortunate thing that has happened to consumptives is to send them to the Southwest without money or acquaint-

ances, with the result that they die of starvation quicker and with a great deal more suffering than they would had they remained at home and taken advantage of what Nature had to offer in their home towns. Therefore, experience has taught us that money is the first consideration in regard to a change of climate, and that sufficient funds to cover all expenses must be arranged before the tuberculous person starts on his trip. The opportunity to take the treatment under a specialist's direction or in a sanatorium must be considered. There are thousands of people going to the Southwest every year, thinking that the air and sunshine will cure them regardless of rest, or the guidance of a specialist.

There is an old saying that if one lives in West Texas a year, one will never leave there for good; I am sure that this is a fact in a number of instances. There, it is possible to live in the open practically the year round and have the benefits of almost continuous sunshine, the effects of which can be appreciated when one leaves this beautiful country and goes to the Northern or Eastern country, especially if one strikes the rainy season. It has often been said that a person who has lived in the Southwest can never live elsewhere for any length of time. It is my idea that if a person has this opportunity, he will not have any desire to live anywhere else, although if necessity compels him to change he can surely do so without harm to himself.

I have noticed that cough and expectoration, as well as hemorrhages, are not as marked in the Southwest as elsewhere in the states. Body temperatures are lower and the average tuberculous complications are not as frequently found as in the Northwestern and Eastern sections, and the mental attitude of the patients is something wonderful. One can be absolutely frank with patients and they do not get excited, as is the case sometimes with patients in the Northern climates. I believe that the mental attitude, to a great extent, is due to the climate which predisposes to health and happiness. There are a few weeks in the summer when the climate in the Southwest is very hot, but usually the humidity is low and a cooling breeze at night makes up for any discomfort suffered during an extremely hot day. I arrived at the conclusion, after studying the question of climate, that a person with an ulcerative case of tuberculosis, who has given his home climate a thorough trial and at the same time kept up the proper standards of treatment, such as rest, fresh air, foods, etc., and who is at a standstill, will, if he is financially able, do well in the Southwest, provided he is under competent medical supervision, and has all other necessary factors.

Altitude was formerly thought to be a cure or help in the treatment of tuberculosis, and it was thought that people living in certain countries at

certain altitudes were immune. This idea has been proved to be erroneous, since it is possible that altitude is harmful to the advanced cases, or at least to some of them, on account of the rarefied conditions of the air.

CHAPTER XIII

ARTIFICIAL PNEUMOTHORAX IN TUBERCULOSIS

Artificial pneumothorax, as a treatment for tuberculosis, has had its cycle of popularity to the same degree as many other treatments for tuberculosis. It is impossible to give any definite indications for the use of artificial pneumothorax, which will apply in every case. It is impossible to tell whether or not a complete collapse can be obtained until we enter the chest. The use of induced pneumothorax is twofold: First, to relieve the disease, and second, to stop hemorrhage. In the relief of the diseased process the local effect is to decrease the function of the lung and to prevent absorption of toxins. At the same time that the lung is being rested, reconstruction of the diseased area is taking place and fibrosis developing. In the case of compression of cavities, the walls which have been approximated, are the site of further healing that will in some cases obliterate the cavities. Dr. Allen K. Krause has shown that fresh tubercles develop in the collapsed lung.

The stoppage of lymphatic circulation results in lessened toxemia, manifested by a decrease in the temperature and pulse and general improvements in appetite, color and general condition. The im-

provement that immediately follows in some cases, especially the lessened toxemia, is almost miraculous. At the same time that toxic symptoms are lessened, cough and expectoration are decreased and, in some cases, immediately disappear.

The use of artificial pneumothorax should be restricted to those cases which have been considered good cases for its application by a specialist, and it should be given by a specialist who has had special experience in this line of work, since some unforeseen complication may occur that will change the whole aspect of the case, if not met just in the right way. It is impossible for the general practitioner to say when a case should have artificial pneumothorax treatment; in fact, it is often a puzzle to the specialist. There are a few general considerations which may be considered regarding the indications for its use.

It is the tendency of the physician, on hearing of a certain treatment for tuberculosis, to use that treatment on all his cases regardless of consequences, not stopping to think that nature has cured hundreds of cases with natural processes. As has been mentioned before, this was the case with tuberculin. Artificial pneumothorax has suffered the disappointing experience following the use of tuberculin; it has been used promiscuously by some with poor results, and the treatment has been definitely discarded as far as they are concerned.

Specialists do not agree today as to when artificial pneumothorax should be done; some use it early; others as a last resort.

I believe that I have made the common mistake of being too anxious and of using pneumothorax too early. At the present time my experience has proved to me that it is best to give a patient a good chance first, with every natural treatment, but not to wait too long before using the compression treatment.

The cases which are to be benefited by pneumothorax treatments are (1) those cases with continuous bleeding; (2) those with more or less high fever and quite a large amount of purulent sputum; (3) those cases without sputum, but with more or less continuous high fever; (4) those cases with apparent walling off of their foci, but with profuse expectoration and normal temperature.

I have seen the best results in the second class of cases, both as to decreasing the sputum and the cough, and also relieving toxemia. In the treatment of bilateral cases which are not doing well, the symptom that is of the greatest value is expectoration. The patient can usually tell where the sputum is coming from, and this is of great assistance in bilateral cases in determining which side to go into when pneumothorax is used as a last resort.

The contraindications in the use of pneumothorax are: associated organic diseases of the heart, liver and kidneys, and also youth and old age. The

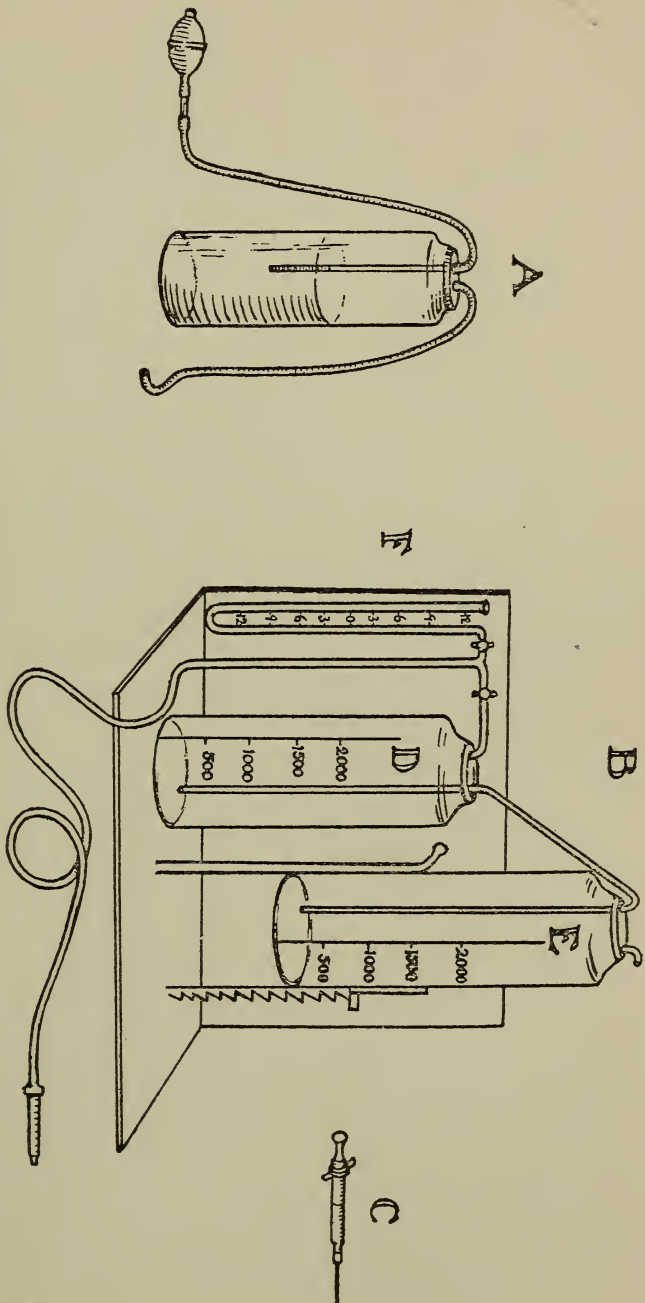


Fig. 5.—Artificial pneumothorax apparatus.

A. Bottle filled with warm bichloride mercury solution through which air is pumped into *D*, displacing sterile water in *D*, which water is forced into *E*.

B. Pneumothorax apparatus ready for operation.

C. Hypodermic syringe with 10 gauge needle for anesthetizing pleural space. Syringe is removed, leaving needle in pleural space, and attachment *G* is then inserted into the needle.

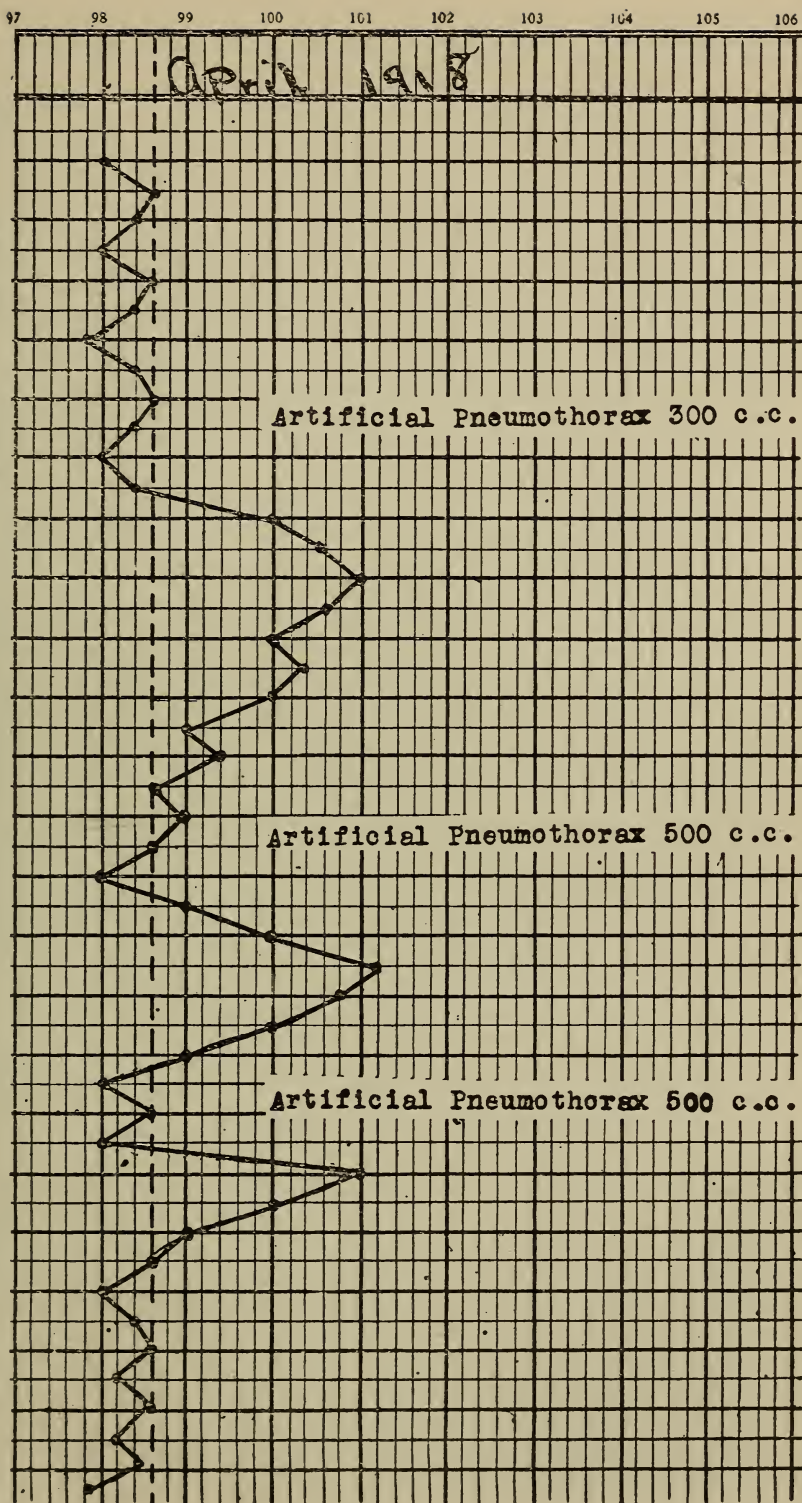
F. Manometer which shows oscillations when the pleural space is reached.

complications incident to this treatment are: rupture of the lung, causing hemorrhage, infection of the pleural cavity and pleural shock. Puncture of the lung can often be avoided by using the clamp invented by Dr. Edward Baldwin, which prevents the needle from entering the pleural cavity over a certain distance. The infection of the pleural cavity is often from within and tuberculous in origin, and consequently these infections cannot be anticipated. The infection from without is often due to carelessness. In compressing the lung, I have used atmospheric air, which has been sterilized by passing through a bichloride solution, and warmed. Pleural shock can nearly always be eliminated by thorough cocainizing of the site of operation, and the administration of a hypodermic of morphine one-half hour before operating. The warming of the air used and reduction of the attempts to enter the pleural cavity to two or three, also decreases the probability of shock.

Pleural effusion occurred in about twenty per cent of all cases which have come under my observation and in a small percentage of these cases I have demonstrated the tubercle bacilli.

As a rule I endeavor to produce a neutral pressure as shown by the manometer, and to give about three hundred c.c. at an operation, with an interval of two days at the beginning, and a longer interval as the lung is completely collapsed.

Fig. 6.—Elevation of temperature following induced Pneumothorax in a chronic unilateral case with a cavity. Discharge from cavity was walled in. As air was absorbed and drainage of cavity returned, fever came down. This case was given up as being unfavorable for collapse.



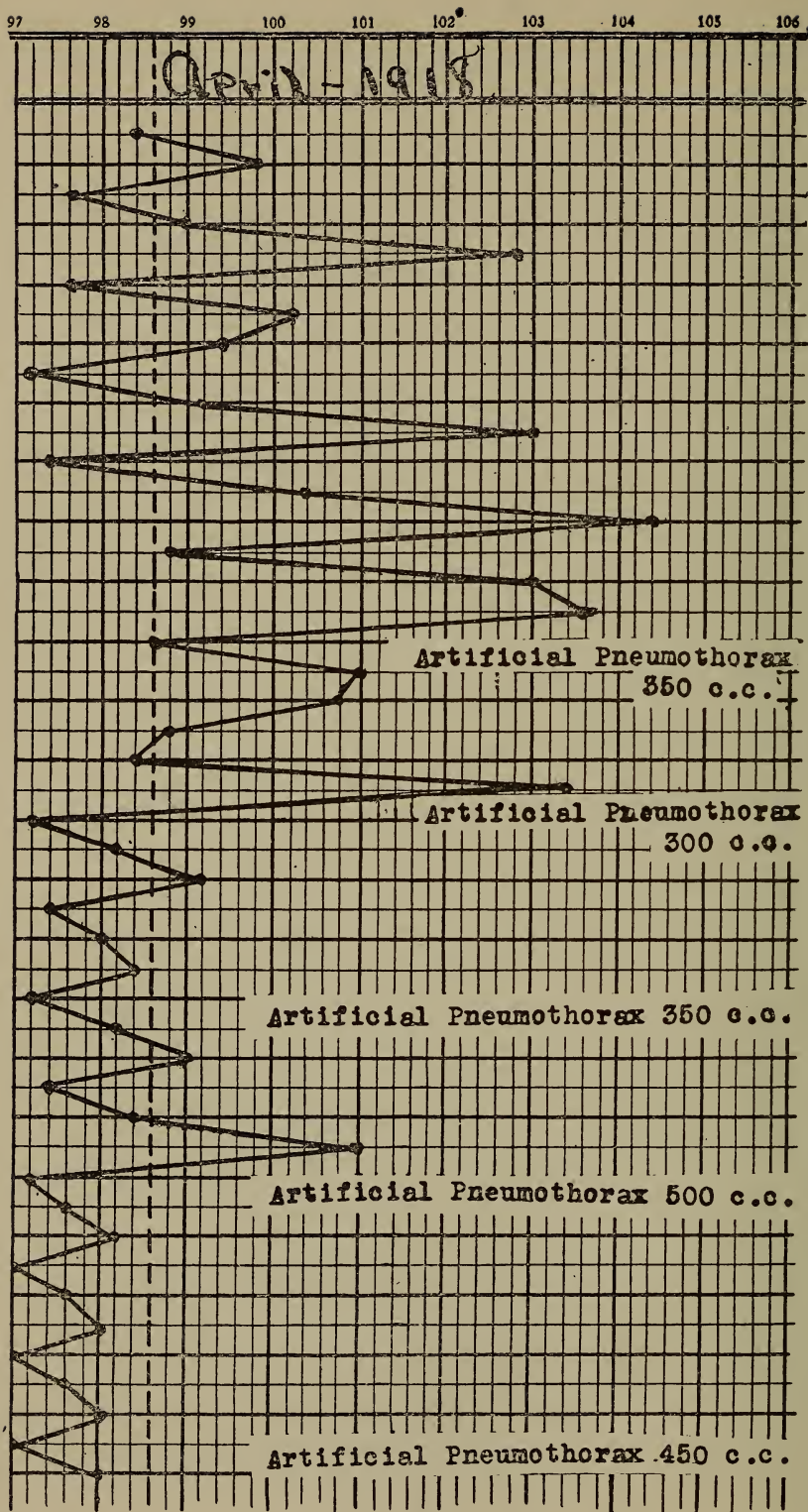


Fig. 7.—Drop in temperature following pneumothorax treatment in a case of chronic tuberculosis. Left side case.

It has been shown that it will take about five days to absorb three hundred cubic centimeters when the pleura is healthy and longer in inflamed pleura, if the inflammation is not acute. In the left sided cases the lung must be watched very carefully, as often there is a flexible mediastinum and thoracic displacement. Embolism is another complication that is occasionally met with, but which can be avoided by waiting until there is definite oscillation of the manometer before instilling air.

The percentage of cases in which artificial pneumothorax is indicated at some time during the process of the disease is undoubtedly large, and the careful administration of this remedy gives promising results in carefully selected cases.

CHAPTER XIV

TUBERCULIN THERAPY

Tuberculin is a term used to designate products of the tubercle bacillus. It was used by Koch to describe his "Old Tuberculin," but now all of the different products of the tubercle bacilli are designated under the common heading of tuberculin.

There are three distinct periods in the history of tuberculin therapy. The first began when Koch made known his discovery of tuberculin in the year 1890. At that time the aim was to produce marked reactions and to continue the treatment until no further reactions were obtained. In lupus, glandular and bone tuberculosis, 10 mg. and in tuberculosis of the lung, 1 mg. were the initial doses. Quite frequently 10 mg. were given to a strong person and rapidly increased. While Koch soon recognized that this severe treatment was only suitable for the incipient cases, very sick and far advanced cases were similarly treated by many physicians. Following this procedure decidedly unfavorable results were obtained in the advanced cases, and the once highly praised remedy was entirely rejected.

During the second period only a few followers of Koch continued their studies on this subject. They, however, made it their business to investi-

gate the causes which were responsible for the unfavorable results in tuberculin therapy. The success of these later investigators brought about a revival of interest in this therapy, and it was again taken up (third era), and was found that in selected cases, if properly given, it was probably of great benefit. Unfortunately, we do not know when it is exactly indicated; the number of deaths that can be traced to the use of tuberculin, in recent times by the general practitioner are evidence that the treatment should be given only by, or under the supervision of the specialist. While it was the object of the early workers to produce a strong reaction, the general opinion at present is that this should be avoided, especially the increase of temperature.

Tuberculin must not be considered a cure for tuberculosis. The question arises whether it is at all possible to obtain active immunization by the injection of an antigen in a condition in which infection has already taken place and produced pathologic changes. The answer to this is to be found in Koch's fundamental experiments, which constitute the starting point of the entire tuberculin study.

If a normal guinea-pig is inoculated with tubercle bacilli, the point of inoculation very soon closes. After ten to fourteen days there appears at the site of inoculation a small hard nodule which

finally ulcerates. This shows no tendency to heal and remains so until the death of the animal. If, however, a tuberculous guinea-pig is inoculated in the same manner, while the point of inoculation closes, no indurated nodule appears. Instead, a necrotic process sets in in the skin after the second day, which finally terminates in the casting off of the slough and the formation of a flat ulceration that heals rapidly. It does not matter whether living or dead tubercle bacilli are used in the second injection.

Koch further showed that the infection of tuberculous guinea-pigs with large doses of tubercle bacilli caused rapid death of the animal, whereas frequently repeated small doses evinced favorable effects upon the site of the injection, as well as on the general condition.

That tuberculin does not meet the requirements of an absolute cure is proved by the fact that an animal immunized against tuberculin will not be protected against a later infection of living bacilli. Hence, it cannot be expected that immunization of a tuberculous person with old tuberculin will protect him against living tubercle bacilli.

On examination of the tuberculous organs of animals treated with tuberculin, there will be found, within the healthy tissues surrounding the focus, a fresh inflammatory reaction. This consists of a serofibrinous exudate and a zone of leucocytes in-

truding to a certain extent upon the tuberculous lesion. Tuberculin acts only on living, not necrotic, tissue. Koch considered that tuberculin brought about death of the tuberculous tissue.

The general practitioner should never use tuberculin, except under a specialist's supervision.

CHAPTER XV

VACCINES IN TUBERCULOSIS

A few years ago, vaccines were thought to be very useful in the treatment of pulmonary tuberculosis. The ulcerative type of case with profuse expectoration was treated in this way.

My experience with 100 cases treated by vaccines at the Massachusetts State Sanatorium, Rutland, Mass., proved to me that this method of treating tuberculosis was not beneficial, and, in some instances, vaccines have done harm.

I have used autogenous vaccines and also stock vaccines in cases of pulmonary tuberculosis complicated by mixed infection in the lungs. The result obtained with both varieties was about the same. In some cases sputum was diminished, but it did not entirely disappear.

Nontuberculous infections in the lungs have been greatly benefited by vaccine treatments. Focal infections with pulmonary manifestations have improved under vaccine treatment.

Chronic influenza and pneumonia of lungs when treated by stock vaccines have shown fine improvements.

CHAPTER XVI

THE USE OF X-RAY IN TUBERCULOSIS

The use of the x-ray in the diagnosis of pulmonary tuberculosis is increasing in popularity, especially from the standpoint of its use by the general practitioner.

We frequently see cases that have been diagnosed as tuberculosis, as a result of these examinations, by the general practitioner. In many cases, if the examiner had used good common sense, he would not have found it necessary to resort to the use of the x-ray.

It has been my experience that many of these general practitioners in using this method of examination for chest work make a serious mistake since they do not know how to make the examination and furthermore do not know how to read the plates. I am sure that the psychologic effects are not the objective of the physician's use of this method of examination, although x-ray examination to the patient means a great deal.

X-ray specialists feel that we can find more extensive involvement with the x-ray than with stethoscopic examinations. The general practitioner, if we can rely on the statements of patients, usually finds, or should find, if he has any ability as

a listener, more with the stethoscope than he actually does with the x-ray.

It is fatal to use this method of examination if we cannot understand how to get results, and if not used in conjunction with other standard examinations for tuberculosis.

My limited experience in x-ray work, coupled with the knowledge gained as a result of reading the works of the specialists in this department of tuberculosis, especially those of Dr. Kennon Dunham, have taught me the advisability of using either or both the fluoroscopic and stereoscopic methods of examination in roentgenologic examinations of the chest.

The fluoroscope shows motion and also allows of the examination of the chest from different angles. By using the stereoscope one can definitely locate lesions in regard to their three positions in the thorax and study abnormal densities in detail.

The value of x-ray examinations is dependent upon the ability of the examiner to determine the difference in abnormal densities as compared with the normal, and to decide what is the cause of these abnormal densities.

The physician, anticipating the use of the x-ray in chest examinations, must memorize these fundamental facts and then must master the technic, which includes the qualities of the rays, time of exposure, and position of the patient relative to the tube and plate. Following this, the physician must

familiarize himself with the anatomic structures which cause the normal densities and be able to compare them with abnormal densities.

Dr. Dunham, by a certain definite technic makes a record of the normal variations of density, which he calls the norm, and with the same definite technic he compares the record of the abnormal densities with his norm. When using the fluoroscope, he advises the examination of the fields to the left and right of the heart and the field between the heart and median line, the latter by the rays passing obliquely, and the two former fields by the rays passing anteroposteriorly, and also in the postero-anterior direction. The extent of the excursion of the diaphragm is noted, and also whether the apices clear up after cough. In cases of slight lesions this method of examination does not easily bring out the definite shadows; these cases should be examined with the stereoscope.

In the stereoscopic examinations of the chest, Dr. Dunham insists on (1) perfected apparatus; (2) mathematical precision of technic; and (3) binocular vision. He explains in detail the exposures, position of the patient, and relation of the patient and tube, and plate and patient. Then he goes over the different anatomic structures and divisions of the chest, noticing any abnormal densities, comparing the findings with his norm, and deciding on the cause of the lesion or lesions of density.

The following x-ray plates and histories have been furnished by Dr. R. T. Wilson of the Temple Sanitarium, Temple, Texas:

CASE 1.—Mr. J. N. H., stockman, age forty-three.

Family History.—Negative for tuberculosis.

Personal History.—Has had tuberculosis for four years, had influenza one year ago, feels like he has not recovered from it though he is now attending to business.

Present Trouble.—About five weeks ago he developed high fever, cough and aching in the bones. He thought he had influenza. Now has some cough and some fever which is intermittent. Has lost only ten pounds in weight, no night sweats or pain in the chest, little expectoration.

Sputum.—Contains pneumococci, diplococci and tubercle bacilli.

Physical Examination of the Chest.—Heart: regular, rapid, sounds clear. Lungs: Numerous rales over both chests anteriorly, tubular type of breathing at base of left and apex of right posteriorly, percussion note diminished along border of scapulæ, some dullness at apex of left lung anteriorly.

X-Ray Findings.—Very extensive mottling throughout the upper three fourths of both lungs which is symmetrical in appearance. A few calcified glands in each hilus.

Heart.—Apparently normal size, shape and position.

Diagnosis.—Pulmonary tuberculosis.

CASE 2.—Mr. D. K. P., insurance agent, age thirty-five.

Family History.—Five cousins died from tuberculosis.

Personal History.—Has had some cough practically all of life and expectorating some thick mucus. Six years ago while standing on the street he had a hemorrhage; went to El Paso for seven months where he gained weight and felt fine and had no more hemorrhage until two years later when he lost a great quantity of blood, in fact, as he thought, came near bleeding to death. He has some night sweats, weight about stationary, thinks he has no fever, doesn't believe he has tuberculosis but came to hospital for treatment for frequent urination and occasional vomiting.

X-Ray Findings.—Right diaphragm shadow partially obscured by pleural adhesions at the base, excursion very limited, the entire

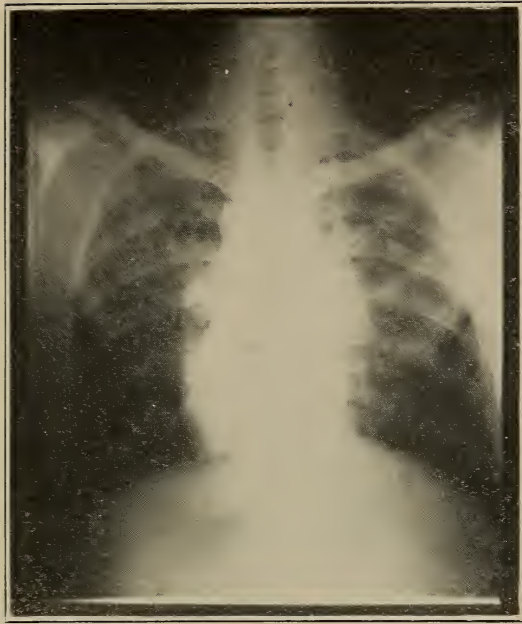


Fig. 8.—Extensive mottling in upper three quarters of both lungs.

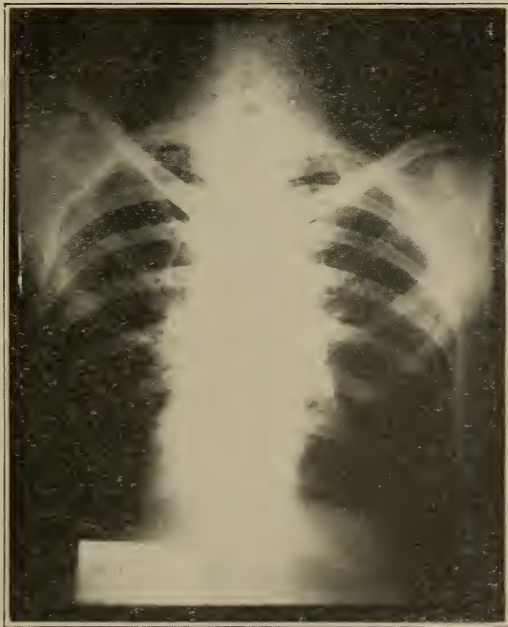


Fig. 9.—Fine mottling evenly distributed throughout both lungs.
Costo-phrenic angles clear.

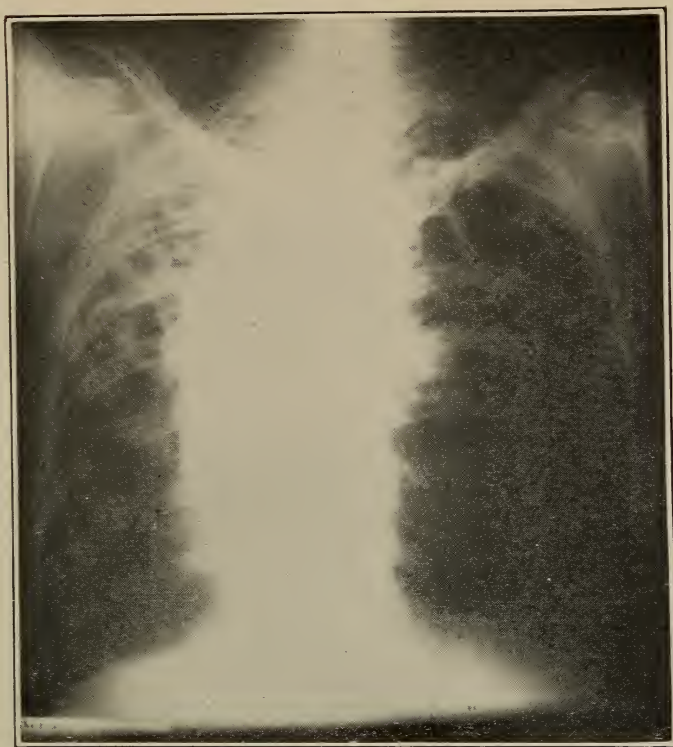


Fig. 10.—Dense adhesions involving diaphragm both sides, and marked infiltration of entire left lung and upper half of right. Upper lobe of left is practically consolidated. A fair-sized cavity in first right interspace.

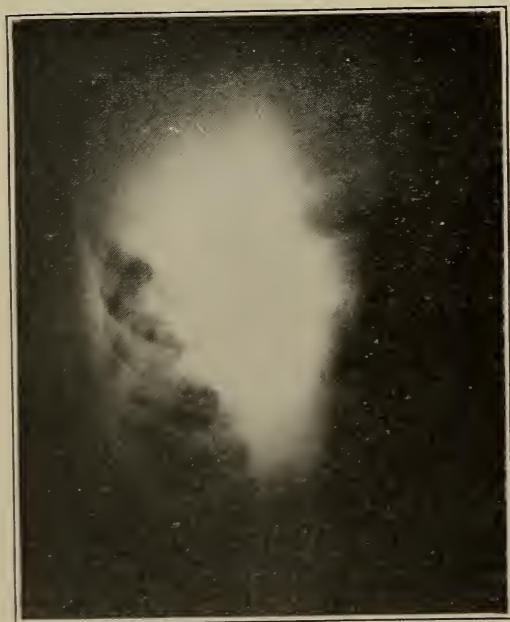


Fig. 11.—Consolidation and cavitation of right lung. Marked mottling in left with dense calcareous glands in hilus.

right lung quite translucent with two rather large cavities near central portion, fair-sized consolidation near the inner border below the hilus. The upper lobe of left lung shows marked mottling with a few large dense calcareous glands in the hilus.

Heart.—Normal.

Diagnosis.—Pulmonary tuberculosis with consolidation and cavitation.

CASE 3.—Mr. W. H. C., retired merchant, age forty-eight.

Family History.—Mother living, seventy-four years of age, had diagnosis of tuberculosis made thirty years ago.

Personal History.—Pneumonia five years ago. Twenty years ago stomach trouble of two years' duration. Chief complaint at present, continued fever, loss of weight and energy. Four months ago was in bed with la grippe twenty days, got up and was clear of fever for about a month when he began having fever again, which has continued to the present, runs as high as 102° F., highest in the afternoon.

X-Ray Findings.—A fine mottling evenly distributed throughout both lungs, the costophrenic angles clear, diaphragm excursion free and equal.

Diagnosis.—Miliary tuberculosis.

CASE 4.—Mr. J. M. McL., farmer, age fifty-three.

Family History.—Mother died of tuberculosis at the age of thirty-eight; one brother of pneumonia and four aunts died of lung trouble.

Personal History.—Had pneumonia six years ago, never fully recovered, gradual loss of strength. During past two years lost about fifteen pounds in weight and has coughed at times, is very susceptible to colds.

Physical Examination.—Some diminution of breath sounds over entire right chest posteriorly. Some increased whispered voice over right apex.

X-Ray Findings.—Dense adhesions involving diaphragm both sides and infiltration of the entire left lung and upper half of right. Upper lobe of left is practically consolidated. A fair-sized cavity in the right interspace.

Diagnosis.—Pulmonary tuberculosis.

CHAPTER XVII

DETAILS IN THE DAILY TREATMENT OF TUBERCULOSIS PATIENTS

There are many considerations in the daily life of the tuberculosis patient, which, when summed up, mean a great deal to him in the way of improvement. A knowledge of physiologic laws and hygiene is necessary in order to master these problems.

A great amount of credit is due to the general practitioner who bases his treatment on good common sense. It is impossible to consider all the daily habits of the tuberculous except in a general way.

The questions that the general physician is called upon to answer are matters regarding the patient's room, bathing, clothing, food and drink, entertainments, and the uses of tobacco and alcohol.

The best room for a tuberculosis patient is one with a southeastern exposure with at least two windows in the room, preferably one on the east and one on the south side, with a sleeping porch on the south side. The room should be heated only when the patient is sitting up or eating, and at these times, if possible, the windows should be open at the top and bottom and the patient kept out of any strong current of air.

There should be as small an amount as possible of furniture in the room, and that should be furniture that can be thoroughly washed. The room should be free from all unnecessary fixtures. The patient should be supplied with sputum cups which are kept covered, and there should be a paper sack pinned on the right side of the bed and also some paper tissues which the patient uses to cover the mouth when coughing. These should be placed in the paper sack after being used and burned at the end of twelve hours.

The patient should have a warm bath at least once and preferably twice a week. A warm bath taken at night causes marked nervousness in some cases, hence, a warm bath should not be given at night in these cases.

A patient's hands should be bathed before and after each meal and the teeth should be brushed after each meal. A glass of hot water before meals is a help in digestive disturbances or when the patient is taking no exercise.

The eating and drinking utensils of the tuberculous should be sterilized by boiling; also, the bed clothing and clothing of the patient should be sterilized before washing.

The question of diet in the tuberculous has received various answers. It has been thought for a long time that milk and eggs in large quantities were absolutely necessary in treating the tuberculous, but it is now thought that a well-mixed diet

of fats, carbohydrates and proteins is the best for the ordinary tuberculous person; hence, milk and eggs, or forced feeding, should not be resorted to if the patient is up to normal weight.

At times it is necessary to give milk in small quantity at frequent intervals to patients with marked digestive disturbances, and at the same time treat the condition causing the disturbance medicinally.

A patient's clothing should be warm in winter and cool in summer, and patients should be cautioned about changing clothing or exposing themselves in going from hot to cold rooms. A patient should try to produce his own heat by eating enough, wearing a sufficient amount of clothing, and conserving his energy.

The use of tobacco, coffee and stimulants, as a rule, should be prohibited. I am reminded of Dr. J. B. McKnight's idea regarding the use of tobacco by the tuberculosis patient. Dr. McKnight feels that a patient's chance to get better is good or bad according to his ability to deny himself pleasures, and that if a man cannot give up tobacco, which he should if confined to bed or having no exercise, he cannot get well.

The evil effects from the use of tobacco in tuberculosis patients result from the habit of inhaling the smoke. To a good smoker, a good cigar is, if not contraindicated, a help, especially in quieting his mind.

Regarding the entertainments, the tuberculosis patient should learn to deny himself of entertainment and false pleasures; in a short time he will realize how false these so-called pleasures really are. He must make a habit of going to bed early and of being free from excitement, either as regards pleasures or worry.

Patients should be very quiet in the evenings, since they are more susceptible at this time to nerve stimulation on account of toxemia being more manifest.

A patient must be made to develop his self-control and must have determination to get well. In short, getting over tuberculosis is a man's game.

CHAPTER XVIII

DIFFERENTIAL DIAGNOSIS IN TUBERCULOSIS

Every patient who exhibits symptoms, either local, reflex or toxic, simulating tuberculosis, should be considered tuberculous until proved otherwise; and while we are proving that the symptoms are not due to tuberculosis, we should at the same time institute the regular treatment which any sick person needs, such as rest, fresh air, foods, etc.

There are many infections, especially the focal infections, which yield symptoms similar to the toxic symptoms found in tuberculosis. There are a few conditions that produce reflex symptoms similar to those of tuberculosis and there are many other conditions that give physical signs similar to those accompanying tuberculosis of the lungs.

The absolute proof of the presence of tuberculosis is in demonstrating the tubercle bacillus, but, as a rule, when the tubercle bacillus is demonstrable in the sputum the disease is in the ulcerative stage and the patient is often beyond hope of any permanent improvement.

The physician of the past has been so scientific in this respect that he has let his patients become far advanced and hopelessly incurable, so that he

could say, definitely and finally, that the patient was tuberculous.

The presence of the tubercle bacillus is a most valuable help in differentiating the nontuberculous pulmonary diseases from tuberculosis. When there is a large amount of involvement of the lung tissue, we naturally expect to find the tubercle bacilli, especially when large amounts of sputum are expectorated. If we do not find them in these apparently advanced cases, it is necessary to examine the sputum further, since it is often the case that some other organism is causing the disturbance and that this condition may be more amenable to treatment than the condition due to tuberculosis.

Often one finds basic cases with quite marked physical signs and a large amount of sputum bacteriologically negative for the tubercle bacillus. These cases should be proved nontuberculous, and the patient should be given treatment while this proof is being established.

Conditions in the chest simulating tuberculosis are chronic pneumonia, bronchitis, streptothricosis, syphilis, and influenza, as well as conditions following organic diseases of the heart, kidneys and liver, producing edema of the lungs.

The physical signs, coupled with x-ray examinations and observation of the constitutional symptoms and a thorough examination of the sputum for the different microorganisms, will in the majority of cases clear up the case.

I recall the history of a case that had all the symptoms of pulmonary and bone tuberculosis except the positive sputum, and who had had an amputation for a supposedly tuberculous knee. The streptothrix was isolated from the sputum, and after iodides were administered this patient got well.

Another case, simulating pulmonary tuberculosis in the physical signs and constitutional symptoms but without positive sputum, made a rapid recovery after proper attention to the teeth and the administration of an autogenous vaccine made from the pus-discharging gums.

These cases are mentioned to emphasize the necessity of examining the sputum in cases with marked physical signs and a large amount of sputum. The physician of the past examined, with negative results, the sputum, or what was really saliva, of the cases that were not yet ulcerative; he thought that the patient with marked symptoms and physical signs must have consumption, little dreaming that often these symptoms were due to other causes or conditions. Syphilis should be excluded in every case of pulmonary tuberculosis, or symptoms simulating pulmonary tuberculosis, and a Wassermann test should be done on every patient.

The cutaneous, subcutaneous or any other test with tuberculin is very dangerous and unreliable, so far as its application by the general physician is concerned.

CHAPTER XIX

PROGNOSIS IN TUBERCULOSIS

Physicians are frequently called upon to express their opinion regarding the probable course and termination of given cases of tuberculosis. This is a very hard problem to decide in the special case; and, in general, we can only consider a few well defined conditions which usually influence the disease one way or the other.

In talking to patients regarding the course and termination of their disease, I emphasize the fact that Nature cures tuberculosis by the mechanical resistance of the tubercle, by fibrous tissue formations, and by the development in the body of substances which neutralize the toxins of tuberculosis. I also insist that their chance of getting well will depend on the amount of rest they take, especially in the early and active stages. They should rest even more when they go back to their former occupation, and should remember they can either rest or play, but not do both.

Dr. Charles Minor says that a given case will usually turn out the opposite to what you believe, considering the prognosis. I have seen this statement proved time and again. The incipient case often dies as a result of some complication, and the

advanced case often becomes quiescent and lives for years.

It is a great mistake for the physician to tell tuberculosis patients definitely that they are going to die. It is also a mistake to tell a patient that he will absolutely be cured in a certain length of time. Usually the physician sets the time for a cure at two to three months, and leaves it up to the sanatorium physician to answer the question of the patient regarding the length of time he must stay in the sanatorium or must remain under supervision.

Only a small number of patients ever become cured. I am in the habit of telling patients that they will get well for all practical purposes if they will follow the advice given them, but that they must always consider that they are not able to do the things they did before becoming sick.

Young girls and boys and also young men and women, who are at the "spooning" age, are poor risks, and I had rather gamble on the outcome of the disease in married people with children at home than on the unmarried. The former are more determined and have better control of themselves.

Mixed infection organisms, developing in conjunction with tuberculosis, render the prognosis a little more unfavorable. This is also true regarding any acute infection, especially where there is a marked inflammation of the lungs.

Heart, liver and kidney diseases are unfavorable complications. Disorders of the digestive tract and

tuberculous infections of the other parts of the body are, generally speaking, unfavorable complications of pulmonary tuberculosis.

Dr. Heise has shown that the cases with streaked sputum and bacteriologically positive sputum are a little less favorable than others. Dr. Trudeau found that his patients treated with tuberculin lived a little longer than those not treated by this agent.

Persistently low blood pressure and increased pulse and temperature, continuing for some time, even though the patient is at absolute rest, are unfavorable symptoms. Bilateral cases that have about the same amount of trouble in both lungs do not appear to do as well as the unilateral cases.

Recent experiments have shown the bad effects of worry and fright on the course of tuberculosis. As a rule, indoor workers do better than those who work outdoors.

The effort put forth by the patient must be considered. It has been often remarked that the future of a person's tuberculosis depends more on what he has in his head than what he has in his lungs.

Left-sided lesions are usually more dangerous than right-sided lesions, due perhaps to the fact that the left lung is smaller and has only one interlobar fissure. Cavitation in the lower part of the lung is more serious than cavitation in the top.

The case with high morning temperature and low evening temperature has a poor prognosis, as a rule, as does the case with the normal morning temperature and high evening temperature.

As a rule, emphysema and spontaneous pneumothorax, which usually ends with empyema, are grave complications. Pleurisy, if not followed by effusion, is not a serious complication. If pleurisy is followed by effusion the effusion often becomes infected, and therefore should be removed, if of any large amount, and air instilled in the pleural cavity to take its place.

Persistent amenorrhea in a tuberculous woman is a bad prognostic sign. Pregnancy often flares up old lesions, and, occurring in active cases, is very unfavorable.

Cardiorenal vascular diseases often influence the disease unfavorably, so far as the tuberculous condition is concerned; but their presence as complications of tuberculosis does not improve their prognosis to the extent one notes when they occur alone. I have frequently seen edema of the lungs, resulting from lack of functioning power as a result of tuberculosis, for all practical purposes cure the tuberculous condition, so far as could be ascertained clinically, but on the other hand, the resulting damage to the heart muscle has resulted in a condition of chronic invalidism, with poor hopes of a very long life ahead.

Diabetes, if properly treated, has not been of bad prognostic significance in my experience, and the result of Dr. Landis' research in such cases, treated by the Allen method, has been very good.

The length of time a patient has had tuberculosis, without any symptoms of very active trouble, increases the chance of recovery, while recurrences and relapses occurring during treatment are of poor prognostic significance.

CHAPTER XX

RESISTANCE IN TUBERCULOSIS

Patients frequently inquire if their resistance is good or bad; especially those who have read much concerning tuberculosis. We often tell these patients that their resistance is good, basing, as a rule, our decision on the fact that the patient looks strong and rugged and is running a fairly good temperature, as well as exhibiting other signs of apparent conquering of the invading organisms. At other times we tell other patients that their resistance is poor, especially when the symptoms of activity are marked; this is particularly true in the cases which have taken treatment for a long time without an apparent improvement in their condition, at the same time showing a large involvement in their lungs and occasionally other tuberculous complications. There are still other patients who have very slight signs in the lungs and at the same time run an elevated temperature and rapid pulse, even after prolonged treatment, as well as being underweight and anemic.

In either case the fact stands out that resistance can be considered only collectively, not knowing the virulence of the invading organisms or their number. Furthermore, it is evident that at times patients, who are very ill, have a better resistance

than those only slightly ill, and that at the same time the invading organisms are of different degrees of virulence.

Corbett cites a case of a man who was married three times, each wife dying with pulmonary tuberculosis. The evidence pointed to the probability of the man having tuberculosis; upon examination he was found to be in the moderately advanced stage, without, however, much activity. This is a familiar example of the difference in resistance due, undoubtedly, to a great extent, to the fact that at times the longer a person has tuberculosis the better is his resistance, on account of the sensitizing of the body cells and the mechanical walling off of the infected area. One should not necessarily expect to find a very ill parent, relative or friend as the carrier of the tubercle bacilli in cases that are very active. The body has built up the resistance of the carrier a great many times; hence, no suspicion attaches to him. The apparent good health of members of a family in which a case of tuberculosis has been diagnosed, should not be a reason for not examining these contacts. In fact, I have often found that the evidence in healthy contacts points to the probability of their having been the cause of the bacilli keeping up their uninterrupted cycle in the active case and probably in many more of their associates. While the carrier does not always need to take the treatment, still it is best to have

him know his condition, and take the necessary precautions to safeguard the health of others.

As is evident, the resistance of the patient depends upon the number of infecting bacilli, their virulence and the length of time that they have been in contact with the tissues. Furthermore the age, occupation, habits, environments, intelligence and the treatment of the person infected, all have a great bearing on the resisting powers.

The resistance of the human being may be considered under the headings of natural resistance and acquired resistance. We know that the body is protected by the reflexes of sneezing and coughing which prevent foreign substances from gaining access to the air vesicles. Lymphatic glands and structures play a great part in helping the body to defend itself against the invasion, as do also the blood cells, especially the lymphocytes. Normally there are different substances in the blood serum which are antagonistic to the outside substances.

Krause has shown how cells protect the body by surrounding the tubercle bacilli and forming the tubercle by the mechanical wall of defense. The development of the tuberculin neutralizing substances further prevents the detrimental effect of this substance. The physiologic effect of exercise and emotion, especially worries and fright, have been demonstrated at times to be detrimental to the best interest of the patient.

Despite the apparent numerous opportunities of the tubercle bacilli to enter the blood stream, the fact that the tubercle bacilli are rarely, if ever, found in the blood streams, in life shows that besides the mechanical resistance of the body cells the blood contains substances which resist the invasion of the blood by the tubercle bacilli. We know from their physical effects that there are antibodies in the blood which we have named bacteriolytins, agglutinins and precipitins.

It has been commonly considered that a person's resistance fell just before death and that the organisms present in different foci invaded the system when the resistance was let down. This has been proved true in a number of instances in other infections, and it would be interesting if the same could be proved of the infections of tuberculosis. Also, the presence or absence of tubercle bacilli in the peripheral blood vessels of very young children, who have meningeal tuberculosis would be interesting to determine.

It is a well-known fact that latent tuberculosis can become active following an attack of measles, pneumonia and tonsillitis, and following vaccination. The presence of other infections besides that of tuberculosis determines the resistance to this disease. Chronic affections of the nose and throat, after being relieved in tuberculosis patients, have apparently increased the patient's resistance to the tuberculous infection.

The development of the condition known as allergy results in lowering resistance in the tuberculous. A small dose of tuberculin can often produce this condition, resulting in the focal, local and general reaction of the tuberculosis patient. The probable chemical action on the focus is a serious one, producing by some change, inflammation, and if severe, necrosis, which results in a breaking down of the mechanical wall of defense and a scattering of the disease. It is possible to get the same reaction following severe exercise, at a certain stage of the disease. I have in mind a patient in the incipient stage, who thought he would have a good time before going to the sanatorium; following a night's dancing and carousing, he had a severe reaction, which resulted in death.

The effect of heat, cold and fatigue has been demonstrated clinically in all diseases.

Familiar to all physicians is the advice given by the general practitioner of the old school to the parents of the chicken-breasted or stoop-shouldered youth, to the effect that the boy would develop consumption. Frequently aged people are seen, who were the subject of such a prognosis, and they naturally boast that they were doomed to early and certain death from consumption, because they had these characteristics, but they fooled the doctor. The older physician based his prognosis on observation of the course of the disease in others similarly affected, not realizing that the child with

these symptoms was already tuberculous, which accounted for these symptoms. The worry of devoted parents over such a prognosis has probably often in itself been a cause of decreasing their own resistance; and as a result, they have in some cases developed the disease, or rather have had their activity increased as a result of this worry.

By living a life as nearly natural as possible, the resistance of the body in tuberculosis is increased. The amount of rest that a tuberculosis patient takes is a great factor in determining resistance. Inheritance of weak constitutions is often the cause of poor resistance in the tuberculous. All lives should be moulded so that the future generations may be free from such inheritances.

CHAPTER XXI

PREVENTION OF TUBERCULOSIS

Broadly stated, prevention of tuberculosis should be considered under three headings: (1) Prevention of predisposing causes; (2) prevention of infection; (3) prevention of further progress of the disease in those already affected.

In view of the recent disclosures regarding the incidence of tuberculous infections it is obvious that present operations along preventive lines should be in the direction of prevention of activation of existing foci. Equally important is the prevention of massive infection from different sources, such as milk from tuberculous cattle and the open case of tuberculosis.

The old idea that a person's vitality was low and then developed tuberculosis is pretty well done away with today. The lowered vitality was probably in many cases the result, instead of the cause, of the disease; however, it is quite possible that prevention of predisposing causes will turn into a mild infection what in some cases would be a severe disease.

The number of conditions and factors which are possibly predisposing causes of tuberculosis are too numerous to enumerate. In general, we can safely

consider a predisposing cause of tuberculosis, anything that is contrary in its effects or actions to the laws of nature. It may be the weakened state resulting from other diseases, operations or injuries, or the effect of habits, occupation or environments, by which the normal makeup or function, or both, of the body is interfered with.

Different tuberculosis specialists feel that we could eliminate tuberculosis from the earth in a few years if we could stir up public opinion in regard to cessation of promiscuous expectoration. Dr. Theobald Smith has shown that tubercle bacilli must live and reproduce in animal tissues, and that there must be a continuous cycle from person to person or from animal to person in order that the infections and disease continue. The public, through the activities of the medical profession, must interrupt this cycle and stop the disease.

The careless and incorrigible consumptive must be dealt with according to the demands of the case. The carefully disposed patients must be educated in things tuberculous. Sputum must be collected in cups which must be covered to keep out flies and insects, and these must be burned with the contents. Patients should be instructed to cover their mouths when coughing and sneezing, and in fact common decency should demand that this be a universal requirement.

Cattle should be tuberculin-tested. If it is impossible, as occurs in large cities, to determine

whether the cattle from which our milk supply comes, are tuberculin-tested or not, the milk should be pasteurized. In fact, there are often so many opportunities of infection of milk by middlemen, that the physician is not going far wrong when he insists that all milk for babies be pasteurized.

All foods, candies and fruits which are not protected by proper coverings or by cooking, should be considered possible sources of infection; hence, one should act accordingly in choosing sweetmeats and food for one's children.

The elimination of handles on the doors of public buildings or public conveyances, as well as appliances operated by hands in public places, should be strongly advocated. The old drinking cup should be eliminated, and our old custom of saluting others by a shake of the hands should be done away with. Kissing, especially the kissing of young children on the lips, is probably a frequent means of transmitting the bacilli and cannot be too strongly condemned. Sterilization of glasses and eating utensils, as well as all other things or articles used in common, should be compulsory. In some states it is unlawful to serve people in public eating houses without sterilizing the dishes after each person has finished eating.

Institution of laws regulating the hours of the laboring class and correction of any insanitary working or living conditions should be resorted to in districts needing these changes.

All those cases that have been in contact with the tuberculous should be followed up, and if they are infected they must be taught the proper way to live and prevent any existing infection from developing into disease.

CHAPTER XXII

THE ROLE OF THE GENERAL PRACTITIONER IN TUBERCULOSIS

A great part of the good to be obtained in the antituberculosis work will be due to the efforts of the general practitioner.

In the past, the general practitioner has not shown the interest in tuberculosis that he should have shown. This lack of interest, in a great many instances, has been due to a lack of knowledge regarding the phases of tuberculosis as understood today.

The general physician has gone by the teachings of the earlier writers in making his diagnosis, and has not relied on natural processes in the treatment of his cases. He has, however, given his case tuberculin, serums and vaccines, according to the popularity of each remedy, but has failed to keep his patient under close supervision.

A sanatorium is the logical place for a tuberculosis patient for a certain length of time. However, most of these institutions have a waiting list which is very long, and many of these cases on account of ignorance of the disease, gradually become worse while waiting to enter an institution.

The physician would do a great amount of good if he would see his patient often, giving him en-

couragement, and putting him to bed until he could enter an institution where he would be under the observation of men trained in tuberculosis. It would be well also if a physician would have a house solely for tuberculosis patients and under the supervision of a nurse, trained in the different phases of tuberculosis work.

Education of the patient is very important, and every patient should have the benefit of the information found in *The Journal of the Outdoor Life*, and in pamphlets put out by the National Association and the Publicity Department of the various State institutions.

Examination of contacts of tuberculosis patients is absolutely necessary.

The general physician must educate his patients in the prevention of infection of their relatives and associates.

The general physician must always be on the lookout for tuberculosis in his patient; he must consider that all of his patients are potentially tuberculous; he must remember that it is impossible to standardize tuberculosis, its treatment and prognosis; he must not expect to find tubercle bacilli in the sputum in order to make a diagnosis of tuberculosis.

Observation of the subjective signs will give him the best indications, as a rule, of active tuberculosis. If he will take note of the tired feeling, the nervousness, pain in the chest, spitting of blood and

general conditions below normal, he will be able to diagnose his case as tuberculosis. By instituting treatment with Nature's processes—rest, fresh air, sunlight and nourishing foods, coupled with constant encouragement and education of the patient, and at the same time teaching him how to lead a natural life, he will achieve wonderful results, and he will be impressed with the fact that Nature cures tuberculosis, if assisted.

Furthermore, while we are beginning to know a great deal about tuberculosis, still we have not yet scratched the surface of the great question. It is probable that we shall not know of a specific remedy for tuberculosis until we know absolutely all the changes that take place in the body of those cases that have, for all practical purposes, recovered from the disease.

It seems almost as if tuberculosis was inflicted on the people as a punishment for their sins in not living natural lives; hence if there is one disease that should make people stop and think about the wonderful remedies of Nature—that disease is TUBERCULOSIS.

CHAPTER XXIII

THE CONTROL OF TUBERCULOSIS

There are many problems, sociologic, economic, medical, legal, political and sentimental, which confront us when we consider the control of tuberculosis.

In order that these problems may be met so that their solution will be successful, or at least more successful than is the case at present, it will be necessary to educate everyone in the different phases of tuberculosis, its causes and effects.

Cooperation is absolutely essential, and those who fail to cooperate for the common good or those who obstruct the good work should be dealt with by the strong arm of the law.

Statisticians have shown that about 200,000 people die annually in the United States from tuberculosis.

In the demonstration work at Framingham, Mass., it has been found that 20 cases of tuberculosis are present where there is one death and that 9 of these cases need sanatorium treatment.

It follows then that there are in the United States 4,000,000 cases of tuberculosis and out of this number 1,800,000 need sanatorium treatment. Furthermore, it was shown in the von Pirquet survey at Framingham, that 50 per cent of the children at

the age of six years had a positive skin test. Post-mortem examination of a number of people dying of all causes showed a very high percentage (97) of tuberculous lesions. It follows that practically every adult person has had an infection or disease of varying severity, and that 50 per cent of all children at the age of six years have been infected. This percentage would increase with the age of the children.

Reports show that cattle and hogs are frequently infected with bacilli. Food products from these animals have been found to contain many virulent bacilli. What is being done to overcome these conditions?

Many tuberculosis sanatoriums, dispensaries and clinics have been opened. Many laws have been made regarding the careless and incorrigible consumptive and much educational work has been done.

The dispensaries do not go out after the tuberculosis patient. The sanatoria, as a rule, are filled with advanced consumptives, and too often under the supervision of politically interested boards of management and superintendents. Many, or at least a few, of the private sanatoria have for their sole object the making of money. The laws which are on the statute books are not enforced.

Antituberculosis work is not standardized. Some states are building numbers of sanatoria to be filled with the advanced consumptives after these con-

sumptives have already infected all their relatives. Other states are making poor attempts to run what few institutions they have. There are some states that are doing very well, so far as efficiency is concerned.

Tuberculosis cannot be controlled by treating it; hence, it is our duty to prevent it.

Some authors have suggested that we should not eradicate tuberculosis, because then the immunity of the human race to tuberculosis would eventually be lost. Even if it were possible to eradicate tuberculosis, we could still grow tubercle bacilli in the incubator and immunize people at stated intervals with the bacilli.

Education of the public is the best means of controlling tuberculosis. Public opinion must demand that all necessary steps be taken to stop the spread of tuberculosis.

Every branch of public health is concerned in the control of tuberculosis. No physician would contend that tuberculosis makes one more susceptible to measles or influenza; but he would assert that measles and influenza stir up a tuberculous focus.

Every person should be considered potentially tuberculous and should undergo thorough physical examinations once or twice each year, or more often, in case there are indications of lung disease. Those who have had contact with tuberculous persons must be more watchful. Suitable work must

be found for the tuberculosis patient. He must realize that he will never be absolutely well, but must always take care of himself and by so doing will live the rest of his natural life.

Adulterations of Nature's processes are often the predisposing causes which activate a healed lesion. Children should be instructed regarding the make-up and the function of their bodies. They should know what are the harmful effects of fatigue, poor air, lack of food and clothing.

The poor man and woman and child must not only be given a chance to live in the right way, but they must be taught how to live, and be made to live rightly.

In the mad rush for the "Almighty Dollar" the human race has lost sight of its object in living. The rich man, in his egotism, has worked the poor man so that he, the rich man, may have money with which, in a great many instances, he lives an unnatural life, while the poor man is also compelled to live an unnatural life, deprived of fresh air, good food, rest and pleasant hygienic surroundings.

As a result of this mad rush, our bodies suffer, and Nature remonstrates in some cases, by stirring up an infection of the tubercle bacilli. If we hearken in time we shall be saved, but if we know not what to hearken for, we shall be lost.

CHAPTER XXIV

HISTORY TAKING

A well-taken history is a great help in the final summary of a case. The history not only brings out the past symptoms and present complications, but it also serves as a guide for the physician in that he does not miss important details in the case.

A physician may feel that it takes too long to make a history in these cases, but he should make it worth his while. He will find it much easier by referring to the history to advise the patient, on future visits.

A card with the following to be filled in will suffice:

Name	Race	Occupation
Address	Birthplace	Civil condition
Date of birth	Sex	

Family History

Father	Mother	Brothers
Sisters	Consort	Children

Previous History

Pneumonia	Pleurisy	Rheumatism
Grippe	Typhoid	Malaria
Appendicitis	Diabetes	Throat disease
Nasal disease	Genitourinary	Convulsions
Hemorrhoids	Operation; Injury	Habits
Skin disease	Smallpox	Paralysis
Deformities	Childhood diseases	

Present Illness

Date and period of exposure.
 Preceding associates (whether relatives or not)
 First presumable evidence.
 First demonstrable evidence.

Symptoms	(date of appearance)	Onset (date)
Hemorrhage	Number and amount	
Fever	Chills	
Pleurisy	Indigestion	Insomnia
Tired feeling	Night sweats	Dyspnea
Loss of appetite	Diarrhea	
Loss of weight	Hoarseness	
Loss of strength	Sinuses	
Cough	Enlarged glands	
Expectoration	(amount and character)	
Previous treatment		

Physical Examination

General development	Nourished	Symmetry
Color of mucus membrane	Teeth	Tongue
Eyes	Pupils	Hair
Fingers	Edema	Cyanosis
Heart	Nose, Pharynx, Larynx	
Height	Weight	

It is best to chart the signs found at each examination and the following may be used:

Charting Signs

- Ib. Interrupted breathing.
- Bvb. Bronchovesicular breathing.
- Bb. Bronchial breathing.
- C. Cavitation.

Râles may be small or large and are designated on the chart by small and large dots.

Dullness and flatness are designated by lines drawn through the flat or dull area. The thickness of the lines denotes the amount of dullness.

Bronchial râles, sibilant and sonorous may be designated by a "V" over the area where these are found.

CHAPTER XXV

STAINING THE TUBERCLE BACILLI

A small amount of the cheesy looking sputum is applied to the glass slide. The smear is allowed to dry after it has been rubbed out to a thin film and then the following procedure is followed:

1. First flood the slide with carbolfuchsin and heat gently over the flame until film seems deeply stained.

2. Wash and decolorize with a 2 per cent solution of hydrochloric acid in 80—95 per cent alcohol. It is well to decolorize until the thinner portions of the film show no red color.

3. Wash in water.

4. For a contrast stain use methylene-blue.

5. Wash and examine.

The bacilli are shown up as red rods with a blue background. This is the Ziehl-Neilsen stain.

CHAPTER XXVI

DON'TS FOR THE PHYSICIAN

1. Do not wait to find tubercle bacilli in sputum before making a diagnosis of tuberculosis.

2. Do not tell the patient to "go West and rough it." *Send* him to a sanatorium.

3. Do not be afraid to give the patient too much rest.

4. Do not fail to instruct the patient and his relatives in methods of preventing the infection of others.

5. Do not tell the patient he will be well in a short time.

6. Do not go by the chest signs alone, but remember that the patient who is apparently very ill, may have the smallest amount of involvement in the lungs.

7. Do not give medicine unless absolutely necessary.

8. Do not overfeed.

9. Do not permit visitors in toxic cases.

10. Do not forget that Nature has cured many tuberculous persons, and that medicines, vaccines and serums have killed more patients than they have cured.

CHAPTER XXVII

MARRIAGE IN TUBERCULOSIS

The consideration of marriage and the factors involved, both preceding and following, is of great importance to the tuberculosis patient.

It is impossible to make any dogmatic statement that will cover every case in question. It is possible to consider, in a general and practical way, the reasons for and against marriage in the tuberculosis patient.

The tuberculous husband and wife must be considered, and most seriously the health of the offspring of tuberculous parents.

To deprive tuberculous people of the most wonderful provision of Nature, in every instance, is criminal. On the other hand, to permit the suffering that ensues as a result of some marriages among the tuberculous, is likewise criminal.

If tuberculosis patients are to live on physiologic lines, affection that is created by beauty or some other condition must be given them.

The stimulating effects of tuberculosis patients, resulting from the association of the sexes, is very marked. Association of men and women patients in a sanatorium, however, should not be permitted to any great extent. Sanatorium patients have too much time to think, and if the patients associate

too closely affections predominate over common sense to the extent that, instead of taking rest, they are really exercising and, in a great many instances, apparently losing all the judgment they once possessed.

Occasionally the patients are jilted lovers. In case their love was sincere, they are very poor risks from the standpoint of prognosis. Continual brooding over their unfortunate love affair lowers their resistance in most cases.

Tuberculosis is practically never inherited. If it were so, it would be necessary for the bacilli to be in the spermatozoa or ova. Occasionally, without doubt, infection of the embryo takes place as a result of the entrance of tubercle bacilli into the uterus. These bacilli may originate from the male or female organs of generation, but only if the organs are tuberculous.

In far advanced tuberculosis of the mother, infection of the fetus can take place through the circulation.

One may recall the so-called "Danish System" of caring for the calves of tuberculous cattle. By isolating the calves of tuberculous cattle and feeding them milk from nontuberculous cattle, it was possible to prevent infection to a great extent, showing that infection, as a rule, was not *in utero*.

Every babe born of a tuberculous mother should be removed from the mother's presence and fed artificially.

Statistics show that the incidence of tuberculosis among children of tuberculous parents is only slightly increased over that of children from well people.

Remembering the foregoing consideration it is permissible to dismiss the subject of the offspring. The father, if tuberculous, usually does as well as if he is single. The main consideration is that of finances. If he is not compelled to overwork or worry he will undoubtedly get along better than if he were single.

The health of the mother is of the most concern. As a rule, the health of the tuberculous mother depends upon finances. If she can take the necessary amount of rest and have the necessary amount of help, she will do well in ordinary circumstances, but if she is an advanced case of the ulcerative type, she will probably not do well under any conditions. If she is an active case of any stage, pregnancy will invariably increase the disease in the lungs.

Norris is of the opinion that a tuberculous mother may have one child and get along all right but that the second pregnancy is more harmful and the third often fatal.

Therapeutic abortion in tuberculosis has been performed too often. The best judgment possible must be used in these cases, but no dogmatic statements must be made to the effect that tuberculous

persons should not marry, or that they should not have children.

Without doubt there are many tuberculous mothers who have a number of children without increasing their disease. It is also possible that, in many instances, there has been an improvement in the diseased lungs, following pregnancy.

On the other hand, we can trace many deaths from tuberculosis in women, as due to the lowered resistance resulting from too many and too frequent pregnancies, with their consequent increased worry and work.

CHAPTER XXVIII

SUMMARY

A summary of the ideas and experiences expressed in this book regarding the diagnosis, prevention and treatment of tuberculosis necessitates a repetition of what has been written before in many other books. It is only by insistence upon and repetition of the obvious that progress is made in any undertaking. The part that the physician and the layman should play in ridding the world of this disease is very evident. The lack of cooperation, due to the lack of knowledge of the fundamental principles of tuberculosis, must be overcome by education. The part that prevention plays is the greatest part. We must prevent the transmission of bacilli by every possible means known to scientists. This will be relatively easy if the people are educated and made to protect the health of others. Those cases that are already infected, must be prevented from developing activity by changing their present methods of living. People must have some other object in life besides making money. Following the teachings of the Old Testament will be of the greatest help. A better knowledge of our bodies and the functions of the different organs will show us the need for using Nature's remedies—fresh air, food, rest and sun-

shine, in larger doses and for longer periods of time. If tuberculosis is to be prevented, the apparently well people (who are, nevertheless, already infected) must be looked after, and the same remedies of Nature, although perhaps in smaller doses, as are used in treating the manifestly tuberculous, must not be neglected.

Doing away with false pleasures and adulterations of Nature's processes will be a great step in prevention. If rest, fresh air, food and sunshine will cure tuberculosis, it stands to reason that the same processes will prevent the activation of any foci in the bodies of people who are apparently well. The death-traps, known as factories and mills, must be looked into. Dwelling houses in cities must be changed. Better facilities for the life of the poor man must be provided in order to get the best results in preventing tuberculosis.

Regarding diagnosis, it is absolutely necessary for the layman and the general physician to discard the old symptoms of night sweats, profuse cough and expectoration, which they have considered in making their diagnosis of tuberculosis, and in their place substitute the symptoms which we have learned are those of early active trouble, such as a tired feeling, slight fever, slight loss of appetite, spitting of blood, cough and expectoration, pain in the chest, rapid pulse, nervousness and indigestion. Laymen and physicians must be more suspicious of tuberculosis, and a physical examination once or

twice each year is best for everyone. The examination must not be a perfunctory affair, but must be thorough and systematic. By all means, the physician should not expect to find tubercle bacilli in the sputum before he makes a diagnosis of tuberculosis. This idea has been the cause of the great mortality in tuberculosis.

Considering treatment, it must be realized that Nature cures tuberculosis with her processes of rest, fresh air, food and sunshine, and that the doctor helps Nature if he understands her warnings and knows what to do. A tuberculosis patient will often overdo matters; then Nature gives the patient a warning to go slow by elevating the temperature, increasing the rapidity of the pulse, and increasing the severity of all other manifestations according to the amount of overexertion.

Medicines, serums, vaccines, tuberculins or external applications have practically no place in the treatment of tuberculosis. Much harm has been done in tuberculosis patients by overtreating them with the above remedies.

Tuberculosis is universal and also relative. Many cases have been accidentally diagnosed. These cases, if inactive, should not be made to lie flat on their back for six months or a year. They should, however, be advised how to live so that they will not reactivate their healed foci.

It must be remembered that tuberculosis is the most curable of all chronic diseases in case an early

diagnosis is made, and early treatment with Nature's processes is instituted.

It must also be remembered that a person who has contracted tuberculosis is never absolutely well, but that for all practical purposes he can live the rest of his natural life if he will cut out false pleasures and live as Nature meant him to live.

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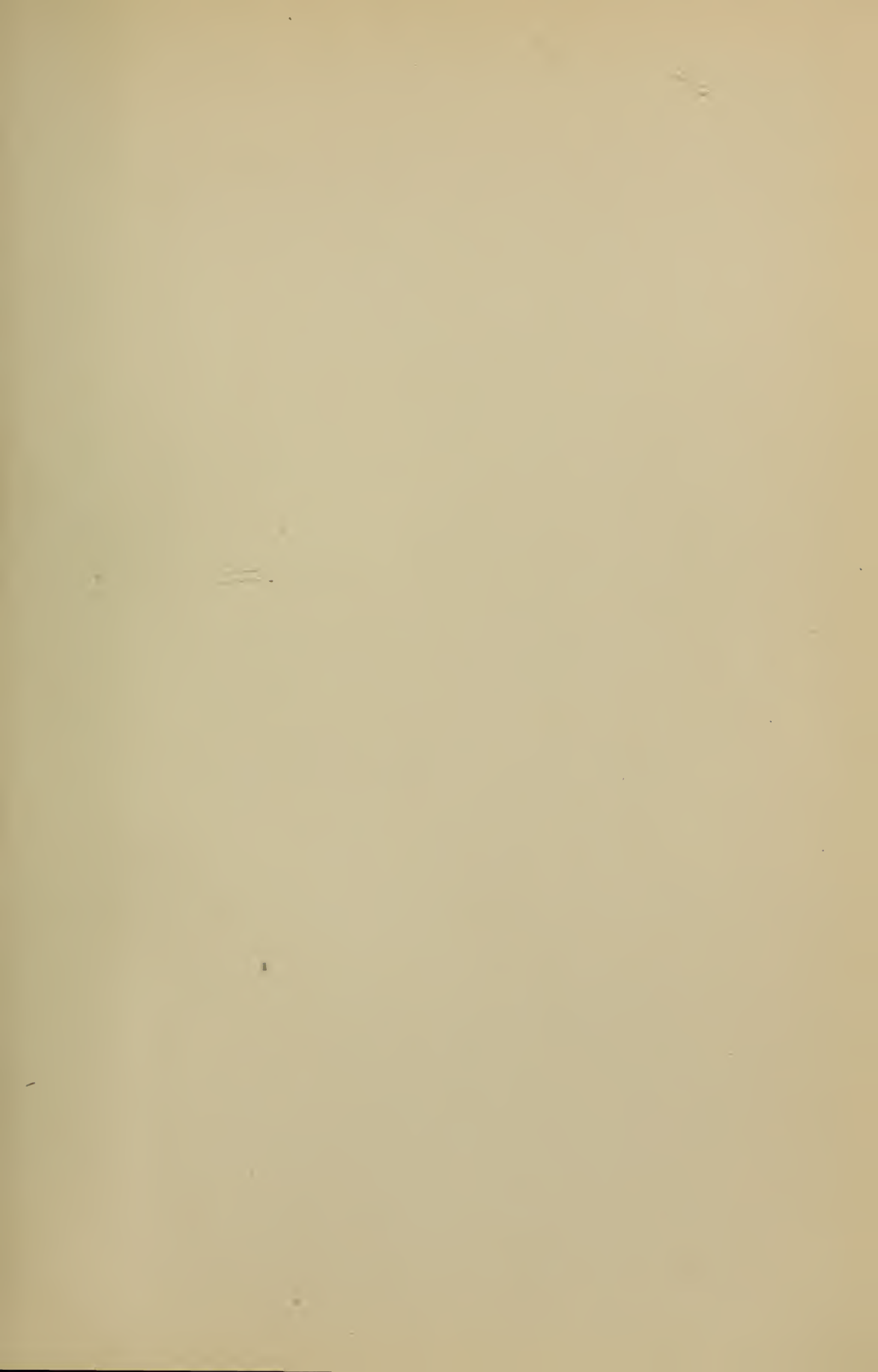
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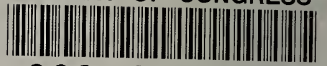
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